THE IRON TRADE REVIEW

VOLUME XXVII. CLEVELAND, O. MARCH 29, 1894. CHICAGO, ILL. NUMBER 13.

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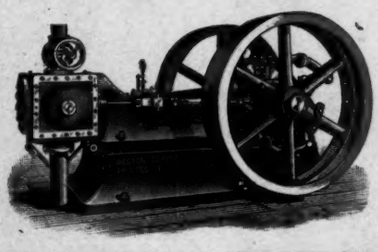

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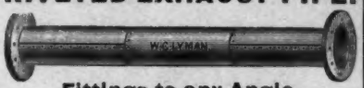

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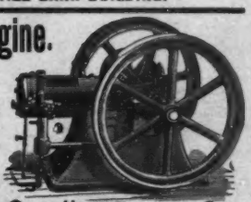

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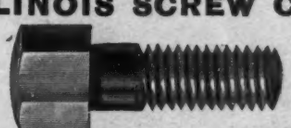

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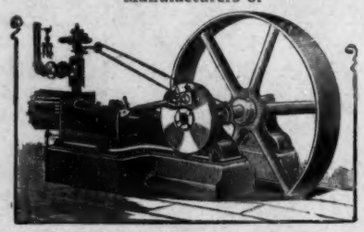

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THE IRON TRADE REVIEW

VOLUME XXVII. CLEVELAND, O. MARCH 29, 1894. CHICAGO, ILL. NUMBER 13.

THE WEEK IN IRON CIRCLES.

GENERAL FEATURES.

Pittsburg and Chicago seem to have furnished most of the moderate activity the iron market has shown the past week, while in the one item of pig iron Cincinnati has perhaps gone above her average record of the last few months. As if a monopoly of the finished material trade of the East were not sufficient, Pittsburg producers of pig iron have found that a $1.50 freight to Philadelphia and $1.30 to Harrisburg has opened the door to wider markets on that commodity and Eastern furnaces are feeling their competition to some extent. On billets the Eastern market is about stationary. A few buyers got favorable terms from Pittsburg mills in anticipation of the reduced freights, but in the main $17.50 and $17.75 Philadelphia is being maintained, sellers having evidently decided to get something for themselves out of the lower freights. Buyers appear to be holding off meantime. The general report, East and West, as to finished material is that large orders are scarcer, but that the demand for small lots is well maintained and the outlook in building lines is generally encouraging. At Chicago structural work is of increasing volume and a good business is promised in plates. Crude steel is the most active feature of the Pittsburg market, and on prompt deliveries makers are more firm in their ideas. Transactions are reported in billets at $15.60. Bessemer pig is somewhat more active, but with no strengthening of prices. Several blocks have been disposed of at $10.40 @ $10.50. Pig iron has shown more activity at Chicago and Cincinnati, but prices are very weak. The threatened break in Southern freights did not come and the reduction on Northerns roads only make competition for Eastern trade the sharper among producers north of the Ohio, a situation not at all helpful to Southern furnaces. There are evidences that consumption of Bessemer pig iron is quite keeping pace with the increased production. It is certain that Lake Superior Bessemer ores form a larger percentage of furnace burdens today than at any time. The foundry interest continues depressed and less than half the melting capacity of the country is active today. There is a belief, however, that the foundry work is increasing, even though very gradually. Railroads seem to be looking for a further reduction in rails to correspond to the decline in steel, but the prospects are not promising.

THE CLEVELAND OUTLOOK.

It has been a quiet week both for ore and vessel interests. No further charters of importance are reported, but the last business done at 80 cents from the head of the lake put the time limit a little nearer the end of the season. Furnace practice with Mesabi ores has been a subject of fresh discussion in the week and the same differences of opinion have developed as to the wisdom of high percentages of fine ores in furnace mixture. An interesting report bearing on the question appears in another column. Buyers and producers are still somewhat apart as to prices for Mesabi ores highest in iron and lowest in phosphorus. In the case of two well known ores the sales of small lots from the dock have been at $2.75. Buyers' offers for larger lots are $2.50.

Pig Iron. Several changes have taken place in valley furnace operations. The Hall furnace at Sharon is about to go out, and the Alice at Sharpsville is out of blast on account of an explosion, investigation of which shows the cutting out of the lining at a point about 16 feet from the top. The probabilities are that a new stack will be built, giving a larger capacity. The furnace was running on 75 per cent. Mesabi ore, divided between Biwabik and Canton. In the Mahoning Valley, Mary at Lowellville started on the 27th on a contract to convert into Bessemer pig a quantity of ore for one of the ore companies. There will be 20,000 to 25,000 tons of iron in the contract, the furnace making the iron for a fixed price per ton. It will be occupied on this contract until July or August. Foundry iron is in a progressive state of weakness and foundrymen continue to order in car loads. Bessemer iron for foundry purposes has not been sold, it is stated, below $10 at furnace. Forge iron is practically marketless. In Lake Superior charcoal there is an occasional inquiry in the market for a season's supply. Detroit sellers are making quotations at $14 and $14.50. Sales have been made from stocks at Buffalo at $14.25. Recently several hundred tons of charcoal iron have been sold at $15.50 Buffalo, the price being determined by low requirements as to phosphorus. We hear of a 24,000-ton sale of Bessemer in the Shenango Valley, below $10 at furnace.

Finished Material. The sales of the week in finished iron and steel make only a moderate total. Mills are quite well employed and orders on the books will take care of the near future, but there is a lull in demand, outside of small ordering. On beams and channels 1.15c at mill is the market on orders of fair size, though in a few instances this has been bettered on large lots. A contract calling for 400 tons of plates is being figured on and there is other structural work involving considerable tonnage soon to come up in Northern Ohio. Valley mills will be more active, now that $4 puddling has been agreed to, but it is probable that the increased volume of puddled iron will be confined to requirements of skelp iron. Bar iron is on a basis that practically precludes puddling. The Cleveland Rolling Mill Co. is preparing to roll steel rails at its old mill, and plans have been made for a new rail mill on another site. As this company is not included in the steel rail agreement, this announcement is significant. The new Johnson plant is quite sure to come within five miles of Cleveland.

THE CHICAGO OUTLOOK.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

The situation in the local market is practically unchanged, nothing of any importance having been done in the past week. Sales of crude material have been a little better than they were the week before, but finished material has had no increase in tonnage.

PIG IRON—Several good lots of local iron have been sold in the past week; among them, one order of 1,000 tons, and one order of 1,500 tons. Besides these there have been quite a good lot of orders ranging from car lots to 200 and 300 tons. Southern iron has also done a little better in the past week, several orders being reported ranging from 200 to 700 tons. Lake Superior charcoal is quiet, only a small carload business having been done. There are several inquiries in the market for both local and Southern iron, and it is expected that the ensuing week will show some quite good sales.

BARS.—No large sales of bar iron have been made in the last week, but dealers report an increased demand. Prices are maintained at 1.15c to 1.20c f. o. b. Chicago. Steel bars have sold fairly well in small lots and the inquiry seems to be better. Quotations are made at 1.25c to 1.30c Chicago.

STRUCTURAL MATERIAL.—One contract for about 800 tons was closed last week, the order going to Pittsburg. Besides this a fair business has been done in small lots. The local mill reports quite a good demand for beams and other shapes, to be used in places where steel has never been used before. Architects are beginning to specify steel for small dwelling houses and stores, and this has opened up a new field for the business that will prove very profitable, it is thought, in the future. Quotations are as last reported. Beams and channels, 1.40c to 1.45c; angles, 1.35c to 1.40c; plates, 1.35c to 1.45c; tees, 1.55c to 1.60c.

RAILS AND TRACK SUPPLIES.—No large orders have been taken for rails in the past week, but local mills expect to close up quite a good deal of business within the next few weeks. Quotations are unchanged. Rails, $25 to $27, according to quality; splice bars, 1.40c; track bolts, 2.40c to 2.45c; spikes, 1.75c to 1.80c.

BILLETS AND RODS.—There is a good demand for billets, but no large sales have been made in the past week. Rods are quiet. Prices are unchanged at $17.75 for billets and $25 for rods.

PLATES.—None of the large orders that were in the market last week have been closed as yet, although it is expected that they will be very shortly. Trade in small lots is a little better. Quotations are as last reported: Tank steel, 1.35c to 1.45c; flange steel, 1.70c to 1.80c; fire-box steel, 3 75c to 4c; boiler tubes, 75 per cent. discount.

MERCHANT STEEL.—Business has been restricted to a few small orders, and the demand is not perceptibly improved. Prices are continued as follows: Open-hearth spring, machinery and tire steel, 1.85c to 1.90c; crucible spring, 3.50c; machinery, 4.50c to 4.75c; tool steel, 6½c and upwards.

SHEETS.—Black sheets are still in only light demand, with quotations unchanged at 2.40c to 2.50c for No. 27, Chicago. Galvanized sheets are in a trifle better demand, but no large business has been closed. Quotations are maintained at 75 and 10 and 5 per cent. discount for mill shipments.

OLD RAILS AND WHEELS.—There was a rumor current to the effect that 5,000 tons of old rails were sold last week but diligent inquiry failed to locate any such sale. There appears to have been very little business done, and prices are nominal at $10.50, Chicago. One sale of 1,000 tons of old wheels was made last week for delivery outside of the city on a basis of $10.50, Chicago. Old steel rails are in very little demand at $9.50 to $10 for long lengths, and $7 to $7.25 for short lengths.

SCRAP.—It was rumored that several large sales running up into the thousands of tons of soft steel scrap were made last week, but it is impossible to verify this. The change in freight rates seems to have made very little difference in the volume of business, which is still very small. Dealers do not look for any increase of trade for the next two or three months. Prices are now made as follows: No. 1 forge, $9; No. 1 mill, $6 to $6.50; No. 1 machinery, $7; axles, $13; cast borings, $3.50; wrought turnings, $4; axle turnings, $5.50; mixed steel, $5; coil steel, $7; leaf steel, $8; locomotive tires, $8; heavy cast, $7; stove plate, $5.

GENERAL MARKET RESUME.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. The activity in the local market the past week has been chiefly in steel, and the sales of 10 days ago in the East, made by a mill that had been able to purchase a cheap lot of Bessemer iron for spot cash, have been followed by others. The low Eastern freights have called these out just now, but such business cannot be of great volume, for most of the billet mills would be unable to make the prompt deliveries necessary to insure the low rates. Latest transactions in billets are on the basis of $15.60, and some producers are asking more. Quite a little Bessemer iron was placed in the week at $10.40 @ $10.50. Increased production of Bessemer pig prevents anything that may be called firmness in price, but the opinion is expressed that the lowest prices have been reached. Foundry business has fallen off of late and grey forge metal is practically without a market. There is still an increased volume in finished material, but the mills that buy their billets and blooms are not able to compete for business on the present basis. Advices from Wheeling note a slightly increased market for steel.

Cincinnati. The week has shown considerable more activity and a number of good sized contracts for pig iron have been closed. Most of the large orders have specified that deliveries shall run from five to nine months. The number of sellers is less now than one year ago, but there are enough to give buyers the benefit of severe competition and prices have been gradually forced lower. Several inquiries for large lots, running up into the thousands of tons have been received and are under consideration. Some of them possibly were to test the market, but others were for the purpose of getting options, in view of work on which the inquirers were bidding. Shipments are going forward rapidly from the South and Alabama stocks are being reduced. A visit at the furnaces shows that nearly all grades excepting Nos. 1 and 2 foundry are in short supply. A new freight tariff will be issued by railroads north of the Ohio River, reducing rates to New York and New England points. It is hoped this will help the Southern brands in maintaining their place in Eastern mixtures.

Louisville. Anything said concerning the market must be virtually a repetition of reports for several weeks past. Opinions are of no value when there are so many speculative elements governing. The slightly improved demand for finished material does not change the policy of pig iron purchasers of covering only immediate requirements.

THE IRON TRADE REVIEW

DEVOTED TO

IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES, IRON ORE PRODUCTION, TRANSPORTATION, AND GENERAL INDUSTRIAL PROGRESS.

PUBLISHED EVERY THURSDAY BY

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B. M. GARDNER, Associate Editor and Western Manager.

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MARCH 29, 1894.

A VALUABLE DISCUSSION.

While it is not announced as a contribution to the current discussion upon the comparative value of physical and chemical analyses in foundry work, we believe the paper Mr. W. J. Keep has prepared for the meeting of the Western Foundrymen's Association this week has an important bearing upon the friendly contest that has been going on East and West, the past two months. And we doubt not Mr. Keep's final rejoinder to chemists, furnacemen and others, to be read before the Foundrymen's Association at Philadelphia will embody valuable results of the painstaking research with which his name has been identified for many years. Without in any way passing upon the merits of the discussion which has been maintained with marked ability on both sides, we must express admiration for the habit Mr. Keep has of appealing to phenomena, to results of investigation, to facts established by research and experimenting. The ability to marshal test upon test, and to connect physical qualities with varying proportions of the elements inseparable from iron in the pig or in the casting, is a dangerous equipment to encounter in an argument. Opinions and theories and traditions cannot cope with it, unless reinforced by a corresponding array of facts. That Mr. Keep's experiments have been with the light gray castings of a stove foundry is one objection that has been made to the drawing of general conclusions from the set of facts so derived. Yet Mr. Keep seems to have provided against any misunderstanding on this point, by stating in one of his papers that all he says or has ever said pertains to ordinary gray iron castings. And while he has, in a sentence here and there, in his first Philadelphia paper, laid himself liable to the criticism that he lightly values the chemist's work, he is squarely committed on that point in the later declaration that "intelligent mixing of irons cannot be accomplished without the aid of chemistry and conclusions must be reached by the united work of chemistry and physical experiment."

The drift of Mr. Keep's argument, as we read it, is that while the chemist aids the foundryman, the latter, in order to produce perfect castings, must know many things which the chemist's analyses cannot tell him. He argues, further, that unless the chemist can furnish the analysis of a cupola mixture when the physical properties of a test bar poured from the molten iron are given, he cannot claim that by analyzing the components of the mixture he can say what will be the qualities of the resultant iron; that when the chemist has determined the silicon, sulphur, carbon, etc., that will be found in the iron coming from the cupola, he is not able to tell what the iron will do—that is, what will be its strength, its chill, its shrinkage. Mr. Keep's challenge to the chemist, then, is to produce a formula that will express the relation between the silicon-sulphur-carbon-manganese-phosphorus content and the physical properties of the iron coming from the cupola.

We do not believe the chemists who have taken part in the discussion will make a claim so broad as this. We take it that they sustain to the iron coming from the cupola very much the same relation that the user of physical tests holds—that of "accessory after the fact." They decide by analyses what changes should be recommended in mixture and thus seek to prevent the recurrence of an unsatisfactory result. Much of the work of both physical and chemical analyst consists in revealing effects; to determine the cause and apply the remedy often means much more. The variation in the strength of iron run from the cupola at different stages of a heat, for example—a subject to which attention was called in a recent communication to this paper—is a thing which both chemist and physical analyst might find difficulty in explaining, were either to approach the subject single-handed.

When the present controversy ends, we fancy there will be a more wholesome respect for each side by the other. At the round-up it will be found that the data contributed include some of the most valuable and practical information in latter-day literature of the foundry.

Certainly no more convincing demonstration could be had of the value of the two foundrymen's associations in stimulating investigation and aiding to give confidence in place of doubt and uncertainty.

BRITISH IRON AND STEEL PRODUCT IN 1893.

The returns of pig iron production in Great Britain in 1893, recently collated by the British Iron Trade Association, show that the total approached more closely to the output of the United States than at any time in five years. From being 6,616,890 gross tons in 1892, Great Britain's output advanced to 6,829,841 tons last year, while that of the United States fell from 9,157,000 tons to 7,124,502. The cause of this sudden approximation in the iron production of the two countries is well understood, but the surprising feature of it is that the British output should have increased even 200,000 tons in a year in which so many influences worked unfavorably to her iron masters. As a matter of comparison we put side by side the production of pig iron in the two countries in the past five years, and in the year 1882. The figures for the last named year show the great difference then existing, in Great Britain's favor. There was a stationary or slightly lessening production in Great Britain and a gradual increase in the United States, in the next seven years, and the figures for 1889 show the status of the race the year before the great change. The British production for last year is notable for marking a pause in the decline that had been without interruption for several years:

	Great Britain.	United States.
1882	8,586,680	4,623,323
1889	8,322,824	7,603,642
1890	7,904,214	9,202,703
1891	7,228,496	8,279,870
1892	6 616,890	9,157,000
1893	6,829,841	7,124,502

The Cleveland district, as heretofore, leads all others in Great Britain, its product being 40 per cent. of the whole. Naturally its blast furnaces have been brought to the highest efficiency, the average annual output being 32,049 tons each. The Cumberland district is next with an average of 31,099 tons. In Pennsylvania last year the average output was 44,000 tons, or 12,000 tons per furnace more than the highest average recorded for Great Britain.

The output of Bessemer steel ingots in the United Kingdom, last year, was 1,493,454 tons, a decrease of 7,356 from the preceding year. Of the total, 262,362 tons was by the basic and the remainder by the acid process. A comparison with the Bessemer steel production of the United States in the past five years is as follows, in gross tons:

	Great Britain.	United States.
1889	2,140,791	2,930,204
1890	2,014,843	3,688,871
1891	1,642,005	3,247,417
1892	1,500,810	4,168,435
1893	1,493,454	3,123,524

Here is shown a gradually decreasing production in Great Britain and a much larger output in this country, amounting in 1892 to about 280 per cent. of that in the United Kingdom.

The Bessemer steel rail production in Great Britain was 579,386 tons, an increase of 43,550 tons over 1892; in the United States, 1,036,353 tons, against 1,458,732 in 1892.

THE ARMOR PLATE PENALTIES.

Secretary of the Navy Herbert, in answer to the House inquiry as to fining the Carnegie Steel Co. in the sum of $140,489 for alleged irregularities in armor plate furnished the Government, tells an interesting story. Yet he does not make it entirely plain why the company was fined thus roundly for furnishing plates which he expressly says stood tests 5 per cent. greater than provided by the terms of the contract. This, on the surface, looks like imposing a penalty on a contractor for doing a better job than he agreed to do.

The narrative of the department's investigations and the method by which information was secured, is a suggestive commentary on the regime at the Carnegie works since the great conflict of 1892. Constantly on the lookout for conspiracies among the men, many of whom had been disappointed in the wages they had received, while others were doubtless in sympathy with the strikers and were looking for an opportunity to deal their employers a blow, it can be imagined that the Carnegie Steel Co. would not be disposed to pay a large sum of money to be divided, in part, among faithless informers, without strenuous resistance. And the more so because its reputation was at stake and there would be a determined effort, owing to the feeling against the company, to use the transaction to its lasting hurt.

The report of Secretary Herbert confirms the original newspaper version of the transaction. Early last Fall a half dozen employes in the armor plate department hired an attorney to lay before the Navy Department details of irregular practices which they said had been going on in connection with work for the Government. A bargain was made by which the informers were to be given 25 per cent. of any fine imposed. The investigation was made by the Bureau of Ordnance and a computation made which would have assessed the Carnegie Steel Co. about $300,000. The matter was carried before the President, who fixed the fine at $140,489, of which the informers got $35,122. The substance of the charge and the gist of the company's answer in the secret hearing that took place at Washington, are thus summarized in the argument before the President, made by P. C. Knox, the company's attorney.

"The board found in its first report irregularities to exist in these particulars:

"A. Blowholes were plugged. To which we replied: Only with the knowledge of inspectors, and then not such blowholes as affected the strength of the plate.

"B. Test specimens were treated after selection. To which we replied: Impossible, as by the contract they were required to be in the custody of the Government inspectors, and besides it is not true.

"C. Plates selected for ballistic test were re-treated after selection in two cases. To which we replied: In one case, yes, for reasons assigned, and we explained why the Government was not hurt and how it might have been benefited in armor yet to be made."

The investigation had brought out the fact that plate 616, which was 21 feet long and represented 348 tons of armor, had been retreated after being selected for testing, and that its tensile strength had been increased from 97,000 pounds to 101,000 pounds. The Carnegie Steel Co. admitted the charge, but explained that a question had arisen among its experts as to the comparative merits of basic and acid steel for armor purposes, and "this additional treatment was given to decide whether it could be beneficially applied to armor plate yet to be manufactured." But previous to this second treatment, this plate and the group it represented had received the same treatment to which all other test plates and groups previously delivered and accepted by the Government had been subjected.

It was admitted by Secretary Herbert, after everything had been said, pro and con, that all the plates in question exceeded by 5 per cent. the requirements of the company's contract; but the fine was imposed under the broad requirement of the contract that the company "must excel as much as practicable," and President Cleveland based his decision on the evidence that "a large portion of the armor supplied was not of the quality which would have been produced if all possible care and skill had been exercised in its construction." In thus deciding he appears not to have been convinced by Chairman Frick's ingenious argument to this effect:

If it be conceded, as the Board of Inquiry had reported, that the plate might have been 15 per cent. better, it does not follow that the price should be 15 per cent. less, since by that logic, if the Government could show a possible process that would bring the armor plate 100 per cent. above the contract requirements, it would be entitled to confiscate the entire consideration and keep the armor besides.

The report of Secretary Herbert expressly exonerates the directors of the Carnegie Steel Co. from any knowledge of the alleged irregularities, but there is a suggestive implication of a responsibility in which both the Government and the company shared, in this concluding statement:

The department is informed that Superintendent Schwab has since the transactions complained of, been removed from all connection and authority over the armor department at Homestead, except as far as concerns the erection of new plants; also that the new superintendence and control of the subject has been placed to its satisfaction in the hands of Mr. Hunsicker, aid to the chairman, Mr. Frick. * * The department has redoubled its vigilance at all points, and wherever night work is being done for the Government inspectors are required to be on duty night and day.

THE Lane & Bodley Co., Cincinnati, have received an order for one of their 24 x 48 Corliss engines from Statesville, N. C., to be installed in a cotton mill. They are kept fairly busy and are now employing quite a large force.

EDITH FURNACE PRACTICE IN DETAIL.

Mr. R. C. Steese, superintendent of the Brier Hill furnaces at Youngstown, recently investigated the practice at the Edith Furnace, Allegheny, Pa., at which, as noted in these columns two weeks ago, 75 per cent. of Mesabi Mountain (South Side) ores were used in the mixture. The following is Mr. Steese's report:

"Mixture—75 per cent. South Side Mesabi, 12½ per cent. Pewabic, 12½ per cent. Sunday Lake, Oliver coke, Valley limestone.

"Burden—4,200 lbs. coke, 8,500 lbs. ore.

"Size of furnace—16′x75′. 13′ 6″ stockline. 9′ bell. Bosh 22′ high. Using seven 6″ tuyers.

"Engines—1 McIntosh, 36″x84″x4′. One Allis, 42″x84″x5′. Running 37 each 25,500 cubic feet air per minute.

"Output for week ending February 10, 1,540 gross tons.

"Work for week ending February 17: Output, 1,701 gross tons; 1,935 lbs. coke; 589 lbs. lime; 60 per cent yield.

"Analysis of pig iron—.094 phosphorus, 1.50 silicon. Only one cast for week ending February 17 over .018 sulphur, and are not making over two casts per week of high sulphur iron.

"Analysis of South Side Mesabi: 63.10 iron; 3.90 silica; 1.40 alumina; .057 phosphorus; 8.00 moisture.

"Remarks: Mr. Reis does not credit good working of furnace to the high straight bosh and would put in a flat bosh if relining, but claims his success is due to large volume of blast and rapid driving of furnace; that by so doing he keeps the furnace open and pressure much lighter in proportion than when blowing less. He made the statement that his pressure was higher when running engines 26 each than now at 37 each. Pressure runs now between 10¾ lbs. and 13 lbs. The furnace is kept full all the time, and ore is not wet before charging, unless they happen to have an exceptionally dry lot, which is not common this time of the year.

"The loss by weight is at present less than four per cent. of ore charged and all flue dust and dust from under boilers is returned to furnace. This four per cent. includes dust from under boilers. The South Side ore is similar in appearance to all other Mesabi ores, but it is a trifle coarser than the Biwabik.

"The furnace has been in blast two years and six months and is in pretty bad shape around the bottom. Are making six casts per day, and I witnessed one cast which was close on to 40 tons and very good iron. They experienced some difficulty the first week they started to blow extra wind, from slipping and making cold iron. The silica in cinder is kept down to 28 per cent. and lime runs about 49 and 50 per cent."

AMERICAN STEEL CASTING CO.

Mr. Joseph K. Bole, president of the Solid Steel Co., Alliance, O., receiver of the Valley Railway, and until recently a managing director of the Otis Steel Co., Cleveland, is to be president of the newly formed American Steel Casting Co. It has been announced that the new national corporation would include only open hearth steel casting companies. The principal plants included are open-hearth plants, it is true, but Bessemer steel casting concerns are also represented. The plants included in the new combine are the Norristown Steel Co., the Standard Steel Casting Co., of Chester; the Sharon Steel Casting Co., of Sharon, Pa.; the Solid Steel Casting Co., of Alliance, O.; the Syracuse Steel Foundry Co., of Syracuse, N. Y., and a majority interest of the capital stock of the Pittsburg Steel Casting Co. The American Steel Casting Co. was recently incorporated under the laws of New Jersey, with a capital stock of $4,200,000 with which to purchase these properties and others. All the charters of the purchased properties will be surrendered and the busines of all the concerns conducted under a single management.

The purchase of the various plants was made by the various stockholders agreeing to exchange their stock held in the single companies for that of the new company, excepting the Standard, of Chester, which was purchased outright, the owners to receive bonds for the purchase money. The extent of the issue of bonds is limited to $700,000, which amount can never be exceeded, except by the consent of 75 per cent. of the stockholders, in stock value, being obtained. Under the policy of the new company, when there is not sufficient work to engage all the mills some of them will be closed down, leaving those open full work.

The board of directors of the American Steel Casting Co. consists of Joseph K. Bole; Daniel Eagan, president of the Sharon Steel Casting Co.; Frederick Frazer, president of the Syracuse Steel Foundry Co.; Augustus Trump, secretary and treasurer of the Pittsburg Steel Casting Co.; George J. Humbert, manager of the Norristown Steel Co.; Henry Weston, of New York, and Charles N. King. The probable headquarters will be Chester, Pa. While there will be a general management for the company, it is understood that the management of the individual plants will be practically as at present.

AMONG THE IRON MINES.

The telegraphed report from Duluth about the Biwabik mine passing out of the control of those who have developed it thus far is untrue. The advance royalty has been paid on the 300,000 ton minimum for 1894 and the use of the name of Tod, Stambaugh & Co. in this connection, in a press dispatch, is not significant, as they have been the sales agents for the Biwabik from the beginning.

Advices to Cleveland parties in interest deny the dispatch from Milwaukee, dated March 26, stating that the Wisconsin Marine & Fire Insurance Co. Bank of that city, has begun foreclosure proceedings against the Chapin Mining Co. on the claim of the bank against the mine for $83,000. The receiver of the bank took $50,000 of the trust mortgage bonds issued by the Chapin Mining Co. last August, and an additional $33,000 worth on account of labor checks the bank had bought from the employes to prevent the latter from levying on the property. The pumps at the mine have been kept in operation since the shut-down last summer, but there is no present prospect of resumption. The trusteeship of Attorney Flanagan, of Iron Mountain, is still in force.

The Lake Superior Iron Co., of the Mesabi, has elected Frank Hibbing president, W. D. Vernam vice president, A. J. Trimble secretary and treasurer, and Frank Hibbing general manager. A dividend of $35,000 was declared, this being the fourth for that amount.

Supt. Brann, of the Duluth, Mesabi and Northern road, will put 50 men at work within a fortnight, with a view to completing at once the road's ore docks at Duluth.

The Aragon mine has about 50,000 tons of ore in stock and is working a force of 300 men.

Unless otherwise ordered, operations at the Penn Iron Co.'s mines will cease on March 31. As stated some weeks ago, this result will have been brought about by the fact that the other mines of the company can produce all the ore needed to fill the present demand, and the closing of the East Vulcan will leave one less organization to maintain. During the past few weeks a number of the employes have taken their settlements and have left for other sections; many of them for the far West. It is probable that many of those remaining will be provided for at the other mines of the company, so that the number of idle men will not be greatly augmented.—[Norway Current.

Valley Puddling Rate Fixed at $4.

The conference between the Amalgamated Association committee and the Mahoning Valley iron manufacturers at Youngstown, March 27, resulted in agreement upon a $4 rate for puddling. The following additional prices were agreed upon: For cast iron swarth, worked on cinder bottom, $4 per ton; for half wrought turnings and half cast iron swarth, on cinder bottom, $3.50, heretofore 85 per cent. of boiling rate; for wrought iron turnings on cinder bottom, $2.60; scrapping and busheling piles on boards, $1.50; busheling on sand bottom, $1.75; for working all light sheet, hoop, etc., $2, heretofore, $2.48 on a 2-cent card. The new scale is subject to change on 60 days' notice. All union mills in the West and the few remaining in the Pittsburg district will have the same rates as above.

THE Crane Co., of Chicago, are in the midst of a strike caused by a reduction of from 10 to 15 per cent. in the wages paid their employes. Altogether about 1,200 men in their several departments have gone out, and so far the company have refused to arbitrate or compromise.

MACHINE SHOP AND FOUNDRY.

CUPOLA HEAT AND QUALITY OF CAST IRON.*

BY W. J. KEEP, DETROIT.

This paper is prepared at the request of several members of this Association. Mr. Findley, editor of *The Iron Trade Review*, agreed to arrange with Messrs. Cary & Moore, of Chicago, for the analytical work if I would furnish a few thoughts on cupola temperature.

The statement was made some weeks ago that a casting made at the last part of a heat was stronger than if made at the first part. An analysis proved that the iron from the early part of the heat contained 2.80 per cent. of silicon, while that from the last carried 2.70 per cent. This would not account for any variation in strength.

We are apt to jump at conclusions. It has generally been stated that as the cupola becomes hotter the iron would contain more silicon, but this analysis and those which I shall present, both show this to be an error. This is also a case where we are deceived by the fracture, for the grain of the casting made early in the heat is closer and lighter in color than that made later on. We shall prove that the difference is caused by the variation in heat at which the iron was melted. (Not the heat of the iron when it was put into the mold.)

No. Series.	No. Test.	No. tests during the heat.	Dead load. Strength	Dead load. def.	Impact. Strength	Impact. def.	Shrinkage. Square	Shrinkage. Flat	Chill.
Series 1.	271	1st Set.	353	.19	322	.....	.158	.163	.10
	272	2nd "	365	.20	314	.....	.129	.148	.10
	272	3rd "	373	.23	271	.....	.133	.150	.10
	273	4th "	371	.22	347	.....	.124	.146	.07
	274	5th "	412	.26	382	.....	.123	.143	.05
	275	6th "	442	.26	356	.....	.124	.140	.02
Series 2.	222	1st Set.	381	.21	254	.....	.183	.197	.25
	223	2nd "	378	21	296	.....	.166	.157	.05
	224	3rd "	360	.20	271	.....	.177	.170	.05
	225	4th "	343	.20	263	.....	.175	.169	.09
	226	5th "	355	.20	288	.....	.166	.164	.08
	227	6th "	369	.21	314	.....	.164	.161	.10
	228	7th "	372	.22	288	.....	.162	.160	.10
	242	8th "	313	.17	246	.....	.173	.168	.15
Series 3.	276	1st Set.	415	.22	322	.....	.167	.168	.15
	277	2nd "	390	.22	322	.....	.157	.159	.10
	278	3rd "	351	.19	296	.....	.155	.154	.05
	279	4th "	369	.....	322	.....	.159	.156	.10
	280	5th "	355	.20	264	.....	.153	.156	.15
	281	6th "	390	.23	245	.....	.143	.152	.10
	282	7th "	381	.22	314	.....	.158	.158	.06
	283	8th "	380	.22	305	.....	.148	.153	.03
	264	9th "	381	.21	331	.....	.130	.148	.20
Series 4.	311	1st Set.	402	.22	313	.....	.160	.168	.15
	312	2nd "	366	.20	330	.....	.139	.153	.15
	313	3rd "	387	.22	280	.....	.133	.150	.08
	314	4th "	382	.21	329	.....	.133	.150	.08
	315	5th "	365	.20	347	.....	.132	.148	.10
Series 5.	316	1st Set.	354	.19	288	.....	.158	.159	.06
	317	2nd "	385	.22	314	.....	.143	.150	.12
	318	3rd "	393	.23	296	.....	.131	.147	.08
	319	4th "	403	.25	313	.....	.131	.147	.08
	320	5th "	388	.21	305	.....	.129	.147	.06
	321	6th "	399	.22	.....	.....	.134	.142	.09
Ser's 6.	322	1st Set.	350	.20	305	.....	.154	.156	.07
	323	2nd "	333	.19	245	.....	.150	.154	.05
	324	3rd "	336	.18	288	.....	.138	.152	.10
Ser's 7.	325	1st Set.	353	.19	296	.....	.161	.165	.16
	326	2nd "	363	.21	314	.....	.145	.149	.07
	327	3rd "	338	.20	288	.....	.154	.154	.08
Ser's 8.	336	1st Set.	360	.18	288	.....	.156	.162	.10
	337	2nd "	378	.22	296	.....	.142	.150	.03
	338	3rd "	348	.20	321	.....	.142	.152	.07
Series 9.	788	1st Set.	373	.21	263	.20	.163	.182	.15
	789	2nd "	369	.21	280	.21	.137	.147	.04
	790	3rd "	367	.21	297	.22	.130	.141	.05
	791	4th "	398	.22	398	.25	.121	.140	.07
Series 10	795	1st Set.	431	.22	373	.24	.158	.165	.08
	796	2nd "	429	.23	432	.26	.132	.144	.03
	797	3rd "	448	.23	424	26	.126	.140	.03
	798	4th "	396	.23	297	.22	.132	.144	.06
Series 11.	799	1st Set.	415	.23	373	.24	.159	.165	.07
	800	2nd "	453	.23	382	.24	.136	.148	.03
	801	3rd "	455	.25	398	.25	.130	.141	.05
	802	4th "	477	.27	415	.25	.125	.140	.06

To reduce the strength of these bars to a bar 1 inch square and 12 inches long, multiply by 8. Each of the above tests (a set) consisted of 5 test bars ½ inch square and 12 inches long, and a companion flat bar 1 inch wide 1-10 inch thick and 12 inches long. Three square bars are broken in a special autographic dead load testing machine, and two square bars are broken in an autographic impact testing machine. Only the averages are recorded.

*Read before the Western Foundrymen's Association, Chicago, March 28, 1894.

When a cupola begins to melt, everything is comparatively cold. There is no slag and the blast has free access to all parts of the cupola. The drops of melted iron are exposed to this cold blast as they fall among lumps of fuel, and on the sand bottom, all of which are colder than the fluid metal.

The first iron drawn from a cupola has been melted under such conditions, but in half an hour the melted iron is covered with a protecting slag and the heat increases until the blast is off. The above series of tests are each averages of from three to six test bars, made at various times, to determine the influence of varying heat. In each case the first set of test bars was poured from the first iron, after about 400 pounds had been taken. The last was in each case taken after the wind was off, and just as slag began to show at the tapping hole. The intermediate tests were taken at regular intervals, the heat lasting about 3½ hours. In some cases, therefore, a test was taken every 20 minutes, and in others they were over an hour apart. In series IX, X and XI the tests were about one hour apart. Two things are evident: There is no uniform variation in strength. There is in each case a decrease in shrinkage and chill.

The following analyses by Messrs. Cary & Moore were of the bars 788 and 791 series IX:

No. Test		Total Carbon	Graph. Carbon	Comb. Carbon	Silicon	Phos.	Sulph.	Mang.
788	Actual analysis of test bars.....	2.910	2.280	0.630	3.220	1.025	0.123	0.49
791	" " " " "	2.950	2.470	0.480	3.140	1.055	0.100	0.47
	Calculated comp. of mixture	2.476	2.110	0.366	3 130	0.911	0.078	0.450
	" " " pigs alone	2.540	2.181	0.359	3.186	0.902	0.064	0.456

In calculating the mixture of the pig iron alone I used analyses which I have of each iron used. To arrive at the regular mixture, 40 per cent. of remelt is added, and deductions are made for loss of carbon and silicon, and additions for the gain of phosphorus and sulphur, which are expected to take place. Evidently the pig iron is higher in carbon and phosphorus than the original analyses show, and more sulphur has been taken from the fuel than I calculated for. I did not figure on cumulative percentages of sulphur, which this and previous analysis indicate should be figured, where a large portion of remelt is returned to the cupola each day.*

It will be noticed that the tests Series IX show less strength than those of Series X and XI. The reason for this is that each test Series IX was poured as soon as the iron was taken from the cupola, while in making Series X and XI the molder poured other work from the ladle and then used the last iron for the test bars. Iron grows stronger as it stands in the ladle. To show this fact more clearly, the following four tests were poured from a single ladle with 28 pounds of iron, the tests being poured one minute apart, or three and one-half minutes from the first to the last. Between times the ladle rested so that the iron could cool, but the iron was not agitated:

No. Test	SERIES XII	Dead Load. Str.	Dead Load. Def	Impact. Str.	Impact. Def	Shrinkage Sq.	Shrinkage Flat	Chill.
784	1st test 1b. 3:17¾ (All from one	388	.23	348	.24	.128	.143	.02
785	2d " " 3:18¾ ladle of 28	393	.21	331	.23	.128	.140	.02
786	3d " " 3:19¾ pounds cu-	424	.21	406	.25	.128	.135	.025
787	4th " " 3:20¼ pola iron.	466	.24	347	.24	.129	.136	.02

The iron of Series IX being poured immediately after it was caught corresponds to test 784 of Series XII, while those of Series X and XI are more like 786 and 787.

Messrs. Cary & Moore found the silicon of test 784 to be 3.460 and the sulphur 0.079, while test 787 has silicon 3.450 and sulphur 0.083. You will notice that the shrinkage and chill of the square test bars do not change, though the more sensitive flat test bars show some decrease. The difference in strength in this case is in no way occasioned by change in chemical composition, but is no doubt due to the internal strain in the first test bar (784) caused by a rigid shell forming about very hot metal, which latter in shrinking causes a stress between the grains, while the last test bars (787) are so cold that the metal at the center does not shrink much. The difference in strength is therefore due to the physical structure.

Now recurring to the analyses of 788 and 791, we should not

*Since writing the above I have received four sulphur determinations of other tests of this same mixture, but made on other days, and the average of the four is 0.081, showing that the day that series IX was made, a car of coke was used with the sulphur higher than usual.

be too sure as to indications without other analyses of other tests. But the similarity between these silicons and the silicons (2.80 and 2.70 per cent.) first referred to, lead us to expect similar results again. The indication is that the carbon burned out slightly before the slag covered the iron, and it is quite certain that we get all the silicon in the casting while the cupola is cold, but that it was burned out somewhat after the cupola became hot. Also it is evident that less sulphur is taken up in a hot than in a cold cupola. The combined carbon is slightly greater in the iron having the most silicon, showing that the increase in combined carbon is due to the conditions in the cupola, and not to chemical composition. The increased chill is also due to these conditions and not to combined carbon or to sulphur.

Chill is probably a union of carbon and silicon and iron, under a peculiar cooling influence, and is not the same thing as the determined combined carbon. With the cooling conditions present at the beginning of this heat, the iron is in such a state that it will take a chill, and often such iron as 788 will solidify with the exterior surface a soft gray, while the interior will be a perfectly white core, the silicon being the same in both. Iron that favors a white core comes at the beginning of the heat when silicon is high, but it is a rare thing to get the conditions that will cause it. As soon as the cupola is hot, half an hour after the iron comes down, such a union cannot be formed.

In tests of pig iron it is difficult to trace chill to the influence of combined carbon, or to any other element. We might perhaps compare the conditions existing when the test bars 788 were made, to a blast furnace with cold blast, which makes a chilling iron. The conditions afterwards are a little more like a furnace with hot blast, which makes an iron with less chill. The question of sulphur should be settled by these tests and analyses. The sulphur is higher than usual, but there never were better castings made, and there is not a sign of chill or hardness or strain. This is the same mixture from which the strong castings were made for which I asked a chemical prescription a few weeks ago.

Understand that I do not say that the sulphur is the cause of the strengh of these castings. I only claim that the quantity ordinarily found in gray castings exerts no influence and can be ignored. Instead of laying the blame on sulphur in the fuel, it should be ascribed to lack of carbon in the fuel, which produces a cold cupola, which is likely to make just such iron as 788.

I do not wish to discuss the sulphur question at this time, because I shall bring forward a large amount of testimony to prove the correctness of my conclusions, at the Eastern meeting April 4th. The good qualities of this iron are not due to chemical composition, but to physical composition, which can always be brought about by careful mixing. The casting 791 has as low shrinkage as can be found in any half inch test bar from a cupola.

This iron had remained in the bottom of the cupola three or four minutes after the wind was off. Some chemists may figure that the slight variation in the chemical composition would account for the variation in the physical characteristics, but we shall at another time prove that this is not so The change is chiefly if not wholly due to physical effects, brought about by the change in heat in the cupola. Very great changes in strength can be obtained by manipulation. From this same mixture I obtained the strong test bar which has been referred to, by simply a slight agitation of the metal in the ladle with a steel bar for 30 seconds. These tests illustrate the sensitiveness of a half inch test bar, which by its variations in shrinkage will indicate the exact influence of each chemical element in the iron, and is the most sure method of controlling a foundry mixture.

I will say only a word regarding the papers introduced at the last meeting. I am not in any way opposed to chemical work; I could do nothing without it. None of the conclusions of this paper could have been reached until the full analyses of the test bars were received.

Chemistry alone has made little progress in the study of cast iron, and many of its conclusions have been wrong. With the ordinary large test bar, physical tests have taught but little. With a small sensitive test bar, by the help of chemical analysis, very much has been done. What I claim is, that a laboratory in an ordinary gray iron foundry, with a chemist such as would naturally be employed, would accomplish less than by the use of the half inch test bar alone. And the way that some founders use a little chemical data is very discouraging. I fully agree that each founder should have a thorough chemical education, but they should acquire the habit of using it in a practical way. For example, Mr. Wheeler proposed a theory, that all iron coming from a furnace contained an equal amount of sulphur and that the more fluid No. 1 iron allowed its sulphur to escape, etc. Now he has the iron running each day, and has a laboratory, why should he of all others theorize regarding sulphur when he could prove it, and thereby add to the general knowledge.

Mr. West claims to have a laboratory and yet in a letter to *The Iron Trade Review*, Feb. 22d, 1894, ascribes the variation in strength, which is the subject of this paper, to the variation in the metal charged, claims that his records show more silicon in a hot cupola, and then reasons from this fact. If such men jump at conclusions with a fully equipped laboratory at their command, it is discouraging for others to begin their use.

Mr. Bolland theorizes regarding chemistry, with which he owns he is not very familiar, and then says that personally he found no trouble in controlling his mixture by test bars. This personal experience of a practical founder is worth more than all that he imagines could be done.

I began this discussion in a paper prepared for this association, but which was received too late for the October meeting, and which was published in *The Foundry* in November. My position regarding Chemistry in the Foundry was plainly stated in that paper. The trouble with such a long-drawn out discussion is that one is likely to be misunderstood by those who have not read all that has been said.

OPINIONS ON FOUNDRY CHEMISTRY.

The discussions in the two Foundrymen's Associations as to the value of chemistry in foundry work have brought out much that is valuable. The chemists have been well represented, particularly in the Philadelphia meeting. Foundrymen have not generally testified on the questions raised. Many of them do not have experimental knowledge; others have regarded the issue as one made between chemists and the champions of physical tests and have been content to look on. With a view to getting further expression from foundrymen, *The Iron Trade Review* sent the following letter of inquiry to superintendents of foundry departments in a number of well known concerns:

"Dear Sir: The recent discussions in the meetings of the Foundrymen's Association, Philadelphia, and of the Western Foundrymen's Association, Chicago, have brought out much of interest relative to the value of chemistry to foundrymen.

"With a view to supplementing this discussion with the experience of representative foundrymen, we are addressing the following inquiries to leading firms in various parts of the country, and will thank you if you will answer them:

"Do you consider that the application of chemical tests, to foundry work, in addition to physical tests, makes a direct saving that warrants the employment of a chemist?

"If you have not had your own chemist, have you been aided by determinations from outside chemists in deciding upon changes of mixture, where your iron has worked unsatisfactorily?

"Do you buy pig iron, to any extent, on chemical analyses and do you employ analyses furnished you by furnacemen in making up your mixture?

"We would prefer not to have a yes or no answer to the above questions, but to have your views on the subject in your own way, merely taking these questions as a basis; and to have your opinion on the general question, how greater certainty as to foundry results can be attained and unpleasant experiences due to sudden variations in the working of metal avoided.

"Yours very truly,

"THE IRON TRADE REVIEW."

A number of replies have already been received, some of which are appended. Others will be published as received. In some cases the statement was returned that the writer had not had sufficient experience in the line indicated to express an opinion:

WALKER MANUFACTURING CO., CLEVELAND.

Replying to your first question, will state that we find it advantageous periodically. To your second: we have governed our mixtures through chemical analysis and physical tests. To the third question: we buy some of our irons on approximate chemical analysis. Yours truly,

THE WALKER MANUFACTURING CO.

THE LANE & BODLEY CO., CINCINNATI.

We beg to answer your inquiries as follows:

1st.—We would consider that a works melting 5,000 tons of iron per year and upward would be warranted in the expense of employing a chemist.

2nd.—We have no chemist and have not had chemical tests made.

3rd.—We do not buy pig iron simply on chemical analysis but give our preference to irons having less of what we consider injurious elements, as shown by analysis.

We have hope that in the future the foundry practice will be much benefited by the study and investigation that is now being given this subject. We fear, however, that the effect of the lining of the furnace and blast upon the molten metal will produce results that cannot always be controlled, and which will to some extent modify the effect which might be supposed to follow the mixture of irons on a chemical basis.

Yours truly, THE LANE & BODLEY CO.

THOMAS DEVLIN & CO., PHILADELPHIA.

We superintend our foundry ourselves by the assistance of a chemist, and as the questions would be rather delicate for him to answer, we answer in order:

1st—We are not prepared to say that the direct saving does warrant the employment of a chemist; but we are convinced the results do warrant it.

2nd—We employ a chemist who is a metallurgist and get a direct as well as an indirect benefit from his labors, and we are not fully prepared to utilize his services. Analysis without instruction on the practical application would be of little use to us.

3rd—We buy pig iron on chemical analysis, and from some furnaces we get practically what we order. We could not, for we are not metallurgists, make a mixture from furnacemen's analysis, even if we knew they were as stated, which we know from practice they are not.

Respectfully yours, THOMAS DEVLIN & CO.

R. D. WOOD & CO., PHILADELPHIA.

We have aimed to keep ourselves posted as to how the various impurities which have a bearing upon foundry practice, affect pig iron; the leading ones of which, of course, are so readily detected in excessive and injurious quantities that we have not felt it necessary to employ a chemist to point out exactly to what extent and what percentages they occur in the iron which we are using. It would seem to us that the parties who could most profitably look at pig iron from the standpoint of chemical analysis are the furnacemen.

We have, to a limited extent, bought pig iron by analysis and when we have done this, we have not found there was any special advantage to be derived from it over and above using due care and ordinary skill, as is customary in all our contracts.

Yours very truly, R. D. WOOD & CO.

LAKE SHORE IRON WORKS, MARQUETTE, MICH.

Our experience has been that the chemical tests are desirable in foundry practice, as well as physical tests. But as our foundry is not a very large one, it would hardly warrant the employment of a chemist. We have not had our own chemist, but have been materially assisted by outside chemists to determine what changes were necessary to give our iron the proper texture.

We buy pig iron of a known standard, or insist upon an analysis before we purchase, so as to assist us in our mixture.

Yours very truly, S. H. HOLLY, Gen. Man.

GRIFFIN CAR WHEEL CO., DETROIT.

In answer to your first two questions, would say that we employ a chemist of our own, and consider that we derive a decided benefit from the practical application of the results turned out from our laboratory. We think that one reason why chemistry is condemned by so many foundrymen is because they do not make the application of their aualysis practical. We consider chemistry is only one of our guides (though a very important one) toward general good results in the finished product. In answer to your third question would say that we do buy pig iron to a great extent by analysis, but we do not rely on the analyses furnished by furnacemen, as we have found that many of these analyses for various reasons are unreliable, and we prefer to base our mixtures on our own analyses taken from the iron we have in stock.

Yours truly, E. A. WALES, Secretary.

WM. SELLERS & CO., PHILADELPHIA.

Replying to the inquiries of *The Iron Trade Review* regarding recent discussions in the meetings of the Foundrymen's Association and elsewhere upon the value of chemistry to foundrymen, the following general conclusions may be offered:

The value of chemical tests to foundry work depends upon many conditions other than the mere making and tabulating of chemical analyses. The ability to apply scientific principles to practical purposes must go hand in hand with the theoretical knowledge thus obtained, and chemical tests may be of much or little practical value, depending upon such circumstances. An experience of six years of daily application of chemical and scientific principles in place of empirical methods in our foundry practice, has given us familiarity with much that is now attracting attention in technical papers as novel. We realized long ago, for example, that pig iron is not a simple material, but it is in reality a complex alloy, composed of a number of dissimilar elements, and that its physical characteristics such as strength, etc., depend upon the percentages of these constituents. We believe the time is at hand, when pig iron must be sold on its chemical analysis instead of on crude methods of grading by fracture.

We find it practicable by the aid of the methods indicated, to produce metal from a cupola, at one heat, adapted to the widest range of castings, and to make such castings under guarantee as to physical qualities. A recent example gave a tensile strength of 30,300 lbs. per square inch, the metal being easily machinable. Pulleys and other small castings were poured from the same cupola a little earlier in the heat.

We might have briefly replied "yes" to each query, but we have endeavored to answer in accordance with the spirit of your request, and may add in conclusion, that the advantages of combining chemical knowledge with practical experience in a large manufacturing establishment are not confined to the points covered by your inquiry. Yours truly,

J. SELLERS BANCROFT, Manager.

Personal.

James E. Dalliba, one of the best known residents of the Marquette region, died at Marquette, Mich., March 23, aged 73 years. He was admitted to the bar at Utica, N. Y., and later practiced at Chicago for 10 years. Then he was appointed attorney general of the Territory of Colorado remaining there four years. He went to the Upper Peninsula in 1866 and was for several years general agent of the Chicago & Northwestern Road, while it was extending its line to various iron properties on the Menominee and Marquette ranges. He resumed the practice of law later at Marquette and held the offices of register in bankruptcy and Circuit Court Commissioner. Mr. J. H. Dalliba, who has been for many years connected with the iron ore interests of Cleveland, is a son of the deceased, and Mr. Alfred Kidder, of Ishpeming, is a son-in-law.

Richard A. Parker, M. E., of Marquette, Mich., has opened a branch office at 407 Lyceum building, Duluth, and will be engaged there for the next month or six weeks. After that he will divide his time between Duluth and Marquette.

Chas. W. Hurlbut, brother of President Hurlbut, of the Hurlbut Mfg. Co., Racine, Wis., and also connected with that company, was found dead March 20.

Mr. John Walker, for a number of years vice president of the Walker Mfg. Co., of Cleveland, in which time he has achieved a national reputation as an inventor and engineer, has accepted the position of general manager of Fraser & Chalmers, of Chicago. Mr. Walker's inventions in power transmission machinery are well known, as is his connection with the production of heavy machinery, particularly that employed in cable railway work. The position of Fraser & Chalmers as producers of mining machinery is indicated by their important installations in all the mining centers of the world.

THE NEW FORBES PATENT DIE STOCK.

The latest development of their Forbes patent die stock has just been brought out by Curtis & Curtis, of Bridgeport, Conn., manufacturers of all classes of pipe cutting and threading machinery. As noted below it embraces several new features. It is known as the No. 3 F, hand or power machine, and it both cuts off and threads all sizes of wrought iron pipe from one inch to six inch right hand inclusive. When this same machine is supplied with both right and left hand dies, it is then called a No. 3 G power machine, and when made without the power base and gearing for hand power only, it is then called a No. 3 F or 3 G hand. It is intended to stand on the end of a bench, when used by power, but when it is desired to use the machine on outside work, it can be disconnected from its base and carried to the place where the work is to be done, like any other tool, and the work done on the spot, thus saving the delay and expense of carting the pipe to the shop.

THE NEW FORBES PATENT DIE STOCK.

As a strong boy can thread or cut off six inch pipe on this machine, the helper does this part of the work while the journeyman puts it up, thus making a saving, which will be appreciated especially on contract work. In this machine the power is derived from a powerful train of triple spur gearing which is said to be ample for even the toughest pipe. The vise for holding the pipe is self-centering and is adjustable to wear. The dies are adjustable to any variation of the fittings and when the thread is cut draw back out of the way and the pipe is taken out without running back. Nipples as short as seven inches can be made without a nipple holder and with the aid of the Curtis nipple holder, short or close nipples can be made.

EXPERT tin plate workers are scarce at Gas City, Ind.

IMPROVEMENT IN STEEL CASTINGS.

We take this extract from a discussion, in the quarterly meeting of the Manchester Association of Engineers at Manchester, Eng., March 10, of a paper on "Steel and its Manufacture," an abstract of which we have already given:

The President, Mr. Thomas Daniels, said that the hydraulic press had done a good work as regards forging, and had, to a large extent, taken the place of the steam hammer. Excellent work had been got with the steam hammer, but when great forgings were required it was not equal to the occasion, and the forging press was adopted.

Mr. Saxon said there had been a great improvement during the last 10 or 15 years as regards steel castings. Many parts of engines, such as cross-heads, cranks and levers, were difficult to forge under the hammer or press anything like to shape, and engineers should see to it whether they could no get steel castings to answer their purpose in these parts better than forgings. Certain parts of engines, such as the triangular connecting rod, for which they could not make a forging, were produced in cast steel, as cast iron would not answer at all for the purpose. With regard to the American output referred to in the paper, he thought the large production in America was due to the greater amount of money spent on the plant, in order to obtain the maximum output as compared with English practice.

Mr. Joseph Nasmith said that notwithstanding the great improvement in the quality of steel castings, makers had not yet succeeded in producing castings which could be relied upon for all times and purposes. M. Gautier, of Paris, and M. Pourcel, of Terre Noire, had said that the blow-holes in steel castings were caused by bubbles of carbonic oxide, imprisoned during the solidification of the steel at the very moment when

they were being expelled from the mass. There was a high degree of probability in this statement, but the point had not been finally settled, and he did not think steelcasters would be able to turn out uniform and reliable castings until the real cause of these blow-holes in the metal was determined. He thought the experiments that were being made with all kinds of metals for producing alloys of steel would eventually be the means by which the question was to be finally settled. M. Gautier and M. Pourcel recommended silicide of manganese as a preventative of blow-holes, and Mr. Robert Hadfield, of Sheffield, had made a large quantity of manganese steel, which was, however, so hard, that the difficulty of machining it was almost insuperable. Steel rollers for spinning machines had never been a success. In hydraulic cylinders, steel castings had proved a great advantage. If the advance that had been made in steel castings was as rapid in the future as in the past, they would soon get steel castings as reliable as iron castings.

Mr. Adamson said that in America they had excellent material, richer ores, etc, and the blast furnace practice there was much superior to the English, both as to material and plant.

Mr. Webb said notwithstanding the improvement in steel castings referred to, he thought he was quite right in his words of caution as to the indiscriminate use of steel castings. As regards aluminum used in steel castings, anything beyond a small quantity of aluminum is undesirable, as it makes the steel very brittle. It should not be used in castings which had thick parts; it is useful in small castings, which cool quickly, thus neutralizing the crystallization. With regard to the Thomas Gilchrist process, he said its benefits in enabling the Continent of Europe to use poor ores in making steel were enormous.

Kotine Paint for Iron Work.

Among recent developments of great value to the iron trade is the manufacture of Kotine paint, which is the last outcome of advanced chemistry in respect to the protection of exposed iron against all influences that induce oxidation. Used as a paint in any desired color, the effect is always satisfactory and every requirement for such an article is fulfilled. Kotine is manufactured from an ore which is a fossiliferous deposit containing oxide of iron, manganese, aluminum, plumbago and silica in such proportions that, in connection with the chemicals used, produce paints possessing greater elasticity, and which will not crack, peel or scale and are perfectly waterproof. The mineral is free from impurity and requires no purifying process, but needs only to be cleaned and dried before being crushed and ground for use. When applied to wood, Kotine renders it incapable of absorbing moisture, and this element of decay being absent, preservation is secured. There are many uses for this article, including the effectual protection of iron, steel or any other metal from the destructive influences of oxidation, and from the action of gases, vapor fumes, salt or fresh water, etc. Kotine has already found a ready sale and in the pamphlet which the manufacturers send out, they refer to a great many well-known firms and corporations which have been steady users of this article for some time.

Kotine is manufactured by the Kotine Mfg. Co, C. R. R. Bldg., Liberty and West sts., New York, and the Western agents are Messrs. Fisher & Porter, 1025 Monadnock Block, Chicago.

CONNELLSVILLE coke production increased from 108,701 tons to 110,741 tons last week, but the shipments were 75 cars less than in the week preceding, being 5,919 instead of 5,994. There were 11,219 ovens active and 6,294 idle, the active list showing a net gain of 194. Pittsburg shipments were more than in the week preceding, but those to Eastern and Western points fell off. Some contracts for furnace coke, involving deliveries some time ahead, have been made at 90c. The sales at 80 or 85 cents have been small and for prompt shipment.

THE Toledo Machine & Tool Co., Toledo, O., write us: "The business outlook seems to be brightening up considerably, and we must say that we have been very fortunate in the past, as our factory has been run on full time right along, with the exception of four Saturdays during the month of August, 1893, and we have managed to keep nearly our full force of hands employed on full time. We are now building some special machines for making steel chain, etc.

ENGLISH AND AMERICAN WELDLESS CHAINS.

In *The Iron Trade Review* of March 9, 1893, appeared an article descriptive of a weldless chain, invented by Mr. Ludwig Herman, of Cleveland. It was designed to obviate the objections to the common welded chain, due to unsuitable material, poor welds, burned iron, unequal pitch, rapid wear, unstable shape, and in anchor chains, the stud and shackle. Strength was one of the chief points aimed at, high-grade steel being used. Each link consists of two straight side bars and two end pieces or yokes, each of the latter having a threaded cavity in which the screw ends of the side bars are secured.

Recent issues of English iron trade journals call attention to a method of manufacturing weldless chain, which is employed at the works of the Patent Weldless Chain Co., at Aston, Birmingham, Eng. The chain is made from a steel bar of cruciform section, and of the greatest length obtainable. This bar is put through a series of machines, in each of which pieces are punched out, so that after five operations the links are perfectly formed, but are still connected together at the point where the inner side of the bow of one link crosses that of the other. In fact the bar represents a rigid chain but on being passed through another machine it comes out a roughly-formed but perfect chain with separated links. The chain then undergoes three more operations in which it is rectified, rounded, and finished ready for use. The process is a cold one, so that there is no deterioration of the metal by heating, the only heat applied being near the end of manufacture, when the chain is annealed in an oven for a short time. Owing to the limited length of the bars the chain has to be made in sections, and eventually coupled up by special links, which are made stronger than the chain itself. These chains are produced in various sizes, from ½ inch down to $\frac{3}{32}$ inch.

The process is evidently an expensive one, in view of the numerous manipulations of the steel bar in the stamping out of the links and in the three finishing operations and the annealing that follow. Mr. Herman's chain is to be made on a machine that not only stamps out the yokes and screws the side bars in place, but tests each link. The economies of manufacture we should judge to be on the side of the American invention.

Changes Contemplated by the Otis Steel Works.

Important changes in the Otis Steel Co. plant in Cleveland are in contemplation. Mr. C. B. Holland, formerly manager of the well known works of Ebbw Vale, has just returned from a visit to the United States, during which he looked over the Otis works with a view to reconstruction. The London *Iron and Coal Trades Review* says: "Mr. Holland does not give a good account of the business situation in the United States. The feeling there is not by any means buoyant, and shrewd business men are not sure that the worst is past. So far as the Otis Company is concerned, arrangements have been made, and are now pending, which will, it is hoped, place it on a sounder and more successful footing. The works did at one time an excellent business, and they only appear to have fallen away since they got into the hands of an English proprietary. But nearly all companies have been more or less in the dumps lately, so that the Otis is not a great exception."

THE summary of reports of inspectors of the Hartford Steam Boiler Inspection & Insurance Co., published in *The Locomotive*, shows that 163,328 boilers were examined in 1893. The whole number of defects reported was 122,893, of which 12,390 were considered dangerous. The number condemned as unsafe was 597. Of dangerous defects, leakage around tubes was reported in 2,909 cases, defective rivets in 1,569. The next most numerous cause considered dangerous was incrustation and scale, of which 865 cases were reported.

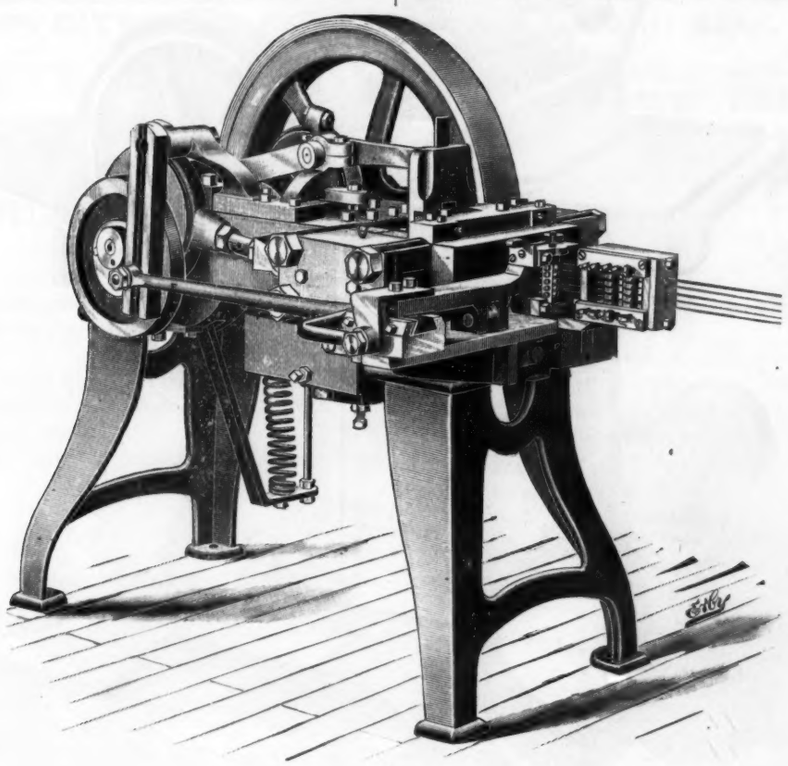
W. G. HYNDMAN & Co., well known for many years in the manufacture of iron roofing in Cincinnati, became on Jan. 1 the Hyndman Steel Roofing Co., and the business will be continued at the familiar stand 52-54 East Second st. They note some improvement in business since the opening of the year, and look for still further betterment. They have built up a good trade in their long business career, and gained a good reputation for their roofing.

KENNEDY FIVE-WIRE NAIL MACHINE.

At the World's Fair last year an exhibit that attracted a great deal of attention from the nail trade was that shown by the Kennedy Wire Nail Machine Co., 903 Masonic Temple, Chicago. It was in Machinery Hall and consisted of two of their five-wire nail machines. One of these was purchased by a Russian concern and shipped to Odessa.

The machine is shown in the accompanying illustration. It effects a great saving over the old way in that it makes five nails at each revolution, instead of only one; thus making a great reduction in the cost of labor, as one man can attend to five of these five-nail machines as easily as he can to five of the one-nail machines. The machine is small, strong, compact and durable, and superior in construction. Three sizes of machines make all sizes of nails.

The five wires are all fed through one feeding device, and by one motion of the machine, and they are gripped by five pairs of dies, held in by one pair of holders, which are closed by a knuckle joint operated from a cam on the shaft of the machine, giving a powerful grip and holding the wires very firm while being headed. The cutters consist of five pairs, adjustable independent of each other, but held firmly in one pair of holders that are operated by a slide, seen on one side of the machine, in connection with an eccentric, causing them to work positively, in both the forward and backward motions. When dull, these cutters can be taken out and replaced by new ones, not stopping the machine more than three minutes to make the change. The heading is done by a series of punches held in one holder, which works in a firm slide and is operated by a pitman from a crank on the shaft of the machine.



KENNEDY FIVE-WIRE NAIL MACHINE.

While this machine produces five nails at each revolution of the shaft, it has no more motions than a machine that produces but one nail at a revolution of the shaft. This permits the running of the machine at a low rate of speed, and there is, therefore, no heating of the working parts, and wear is reduced. The small size weighs 1,500 pounds, and makes all sizes from six penny down to the smallest used, producing over 900 nails per minute.

The second size weighs about 3,600 pounds, and makes all sizes from six penny to twelve penny nails, producing 750 nails per minute. The largest size weighs about 8,000 pounds, and makes all sizes from twelve penny to sixty penny, and produces 300 nails per minute.

All the working parts of these machines are made of forged steel, and built by first class workmen. The makers have facilities for producing these machines in large quantities and as all parts are made in duplicate any repairs can be furnished promptly. They are constantly filling orders, and the machines are giving perfect satisfaction, as they save about three-fifths of the cost of making nails where the best single wire nail machine is used.

Further information, circulars, etc., can be obtained of the manufacturers, as above.

The Smoke Crusade in Chicago.

The smoke inspector of the City of Chicago is making preparations for an energetic campaign this spring, against all offenders. His first move will be made in the outlying districts, and he has already made arrangements with the owners of some of the new buildings in the World's Fair district for a conference from which he hopes good results will come. He expects to induce these owners to abandon the use of soft coal, and to get them to use hard coal instead. It is the e x pectation too, that some means of co-operation will be adopted between the smoke and building departments of the city, whereby an ordinance can be got through the Council clothing the Building Commissioner with authority to inspect all power, light and heat plants, and enable him to compel the owners of new buildings to put in smoke consumers. There surely is an excellent field for work of this kind in Chicago, and while former smoke inspectors have done good work, there are still left many offenders against the smoke ordinance who should be brought to see the error of their ways. It is only by persistent and continued effort that the atmosphere of Chicago can be made clear.

THE Prentiss Tool & Supply Co., 59 S. Canal street, Chicago, and 115 Liberty street, New York, have just issued a list of second-hand tools, which they claim is the largest of its kind ever sent out by a machinery house. It contains a large number of engine lathes, hand or speed lathes, chucking and brass lathes, gang, sensitive and upright drills, planers, shapers, etc., and will be sent to anyone on application at either of their offices.

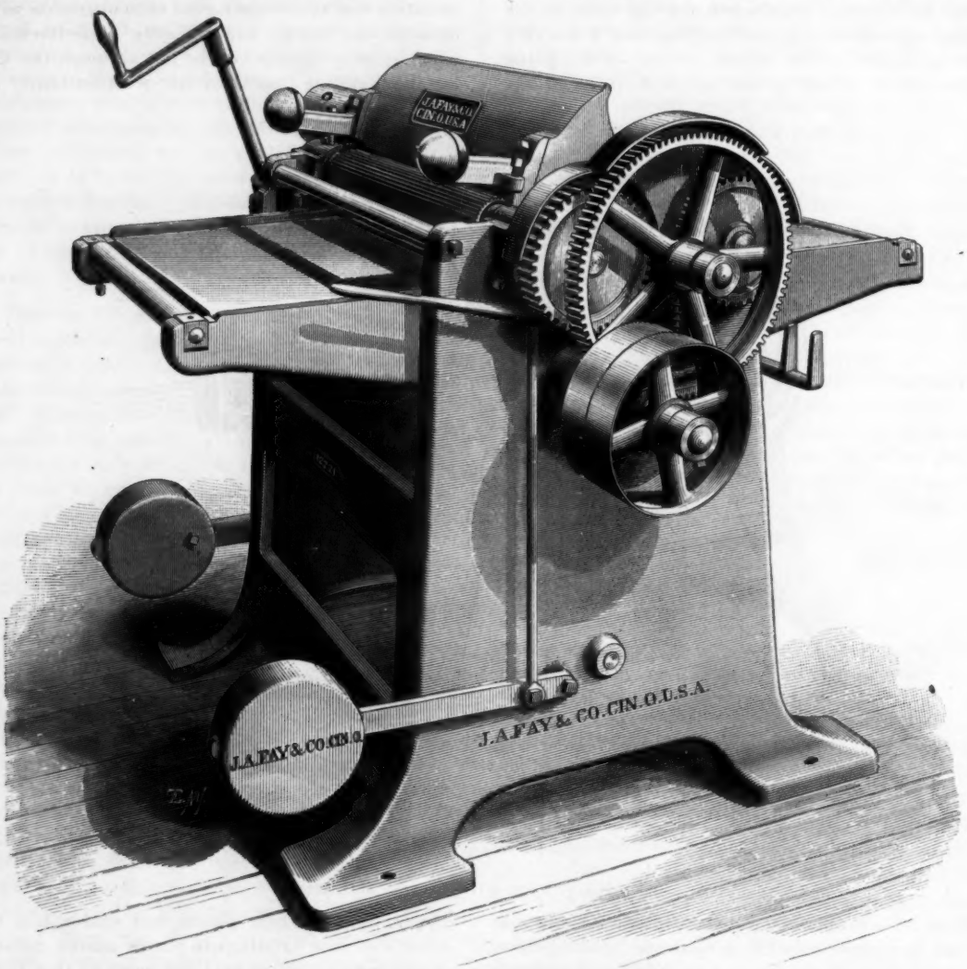
THE Providence Steam Engine Co., for whom Messrs. Fisher & Porter, 1025 Monadnock Block, Chicago, are Western agents, report that their factory is full of orders, and that they are running day and night with a full complement of men.

NEW SURFACE PLANING MACHINE.

In the design of the machine herewith illustrated the makers have endeavored to meet the wants of pattern makers, etc., for a machine which will, with very little power, surface in a superior manner all kinds of hard and soft wood. It is regarded as one of the best machines for the money yet designed. Three sizes are made: to plane 16″, 20″, and 24″ wide, and from 1-16″ to 6″ thick. Pressure bars are fitted on each side of the cylinder for planing thin and short stuff, and also for producing a fine surface, whether on panel or cigar-box material.

The frame is cast in one solid piece, securing great strength and solidity over the old way of bolting together. The cylinder is made of crucible steel, with lips to break the chip.

The journals are of large diameter, and run in patent self-oiling bearings. The cylinder-boxes being cast to the side of the machine are rigid and strong, and not liable to vibration or disarrangement. The bed is raised or lowered by means of a crank and rod, conveniently located for the operator, connected by gears to raising screws, for adjusting the machine to different thicknesses of material. The bed is hung between gibs in the frame, by the adjustment of which all wear in it can be taken up. The cutter-head and feed-rolls being hung in the frame preserve the same relative position with the bed-plate, which is not always the case where the rolls and cylinders have independent adjustments. An index-gauge attached shows the thicknesses to be planed.



NEW SURFACE PLANING MACHINE.

The feeding rolls are large and strongly geared, and the first pair are heavily weighted. The platen is long, provided with friction-rolls, and all joints are planed and holes reamed.

When the countershaft is placed at a distance of 7′ from the cylinder of the machine the following belting is required: One belt 17′ 4″ long, 5″ wide, to drive the cylinder of 24″ machine or 4″ wide for the 20″ and 16″ machines; one feed-belt 16′ 3″ long, 2″ wide. A countershaft, hangers and pulleys, are furnished when wanted. J. A. Fay & Co., 286 to 306 W. Front st., Cincinnati, are the manufacturers.

PUBLICATIONS RECEIVED.

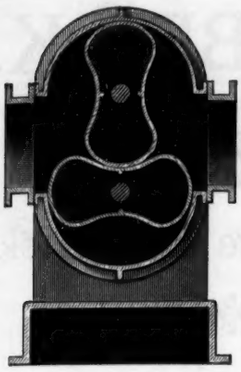
The depression in trade has not been without very creditable contributions to catalogue literature. A model one in many respects is that of F. E. Reed & Co., Worcester, Mass., manufacturers of engine lathes, chucking la hes, screw-cutting foot lathes and hand lathes. Conforming to the standard recommended by the American Society of Mechanical Engineers, it is 6x9 inches and the cover, being cloth-faced, insures its preservation. The first half of the book is devoted to the engine lathes of 12″ to 30″ swing, of which the company make a specialty and then in turn its screw cutting foot-lathes, hand and chucking lathes. The later pages are given up to planer chucks, countershafts, milling machines and lathe tools.

The catalogue for 1894, issued by Berger Bros., of Philadelphia, confirms the claim of that firm that theirs is the largest tinners' hardware and roofers' supply establishment in the United States. Several hundred illustrations suffice to acquaint the reader with the manifold lines of supplies carried and emphasize the increasing number of devices that make work in these lines more effective. The Berger gutter-hanger is one of the most important of their patented articles, and the illustrations in this and other departments of the catalogue show how great advance has been made in building ornamentation and in the stability of roofers' and tinners' work.

Mast, Crowell & Kirkpatrick, Springfield, O., send us their "People's Atlas of the World for 1894"—a quarto of 125 pages, issued as double number 110 of their Farm and Fireside Library. It is filled with maps and illustrations, which are accompanied by copious text.

WATSON H. WYMAN, for several years carrying on business as a dealer in roofing and building papers at No. 4 Main st., Cincinnati, O., has removed to 104 Main st., east side, between 3rd and 4th streets.

J. B. THOMPSON, Haughville, Ind., will build a brass foundry.



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POSITIVE PRESSURE BLOWER NOW ON THE MARKET.

On the above basis, patronage is respectfully solicited by

The Connersville Blower Co.,

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Manufacturers of a full line of Blowers, Gas Exhausters, Pumps, Etc.

Correspondence Invited. - - - - - - - Estimates Cheerfully Furnished.

LAKE SHORE IRON WORKS, MARQUETTE, MICH.,

Manufacturers of MINING MACHINERY.

HEAVY ROCK CRUSHERS FOR IRON ORE

A SPECIALTY.

THE GARDEN CITY SAND CO., Suite 1015 Security Bldg, CHICAGO, ILL.

FIRE BRICK, FIRE CLAY,

For Blast Furnaces, Cupola Lining, Boiler Setting, Smoke Stack Lining, or Any Other Purpose.

EVERY CLASS OF SPECIAL SHAPES AND SIZES.

ALL KINDS OF

Foundry Supplies.

FACINGS, BLACKINGS AND MOULDING SANDS

Of All Kinds.

INDUSTRIAL SUMMARY.

New Enterprises:—

The following recent incorporations, specially reported for *The Iron Trade Review*, are of interest to the iron and machinery trades:

Jackson, Mich.—Harmon Mfg. Co.; capital, $25,000; to manufacture and sell all kinds of machinery; incorporators: Milford Harmon, Samuel B. Collins, Harvey C. Collins, Jackson, Mich. Address letters care of Harmon Mfg. Co., Jackson, Mich.

Pottsville, Pa.—The Light Cycle Co.; capital, $25,000; for the manufacture and sale of iron or steel or both, etc.; incorporators: Wm. I. Grubb, Wm. H. Reifsnyder, Jr., Milton P. Grubb, Pottstown, Pa. Address letters care of J. H. Maxwell, Pottstown, Pa.

Allegheny, Pa.—The Seipp Mfg. Co.; capital $20,000; for manufacturing and selling of articles of commerce from iron or steel or both; incorporators: W. V. Taylor, H. C. Seipp, Wm. Dieckman, Allegheny City, Pa. Address letters care of W. V. Taylor, 349 Beaver ave., Allegheny, Pa.

Louisville, O.—The Louisville Steam Pump Co.; capital, $25,000; for manufacturing, selling and dealing in steam pumps, etc.; incorporators: Frank Paquelet, Louis Rebillot, Stephen Paquelet, Frank Rebillot, A. F. Juillard. Address letters care of W. S. Earseman, Louisville, O.

Ellwood, City, Pa.—Baker Forge Co.; capital, $5,000; for the manufacture of iron or steel or both or of any other metal, etc.; incorporators: Jas. H. Baker, Allegheny, Pa., H. W. Bishop, Jr., Osborne, Pa., W. N. Martin, Pittsburg. Address letters care of Lyon, McKee & Sanderson, 118 Diamond st., Pittsburg, Pa.

Chicago, Ill.—Bower Machine Co.; capital, $40,000; for manufacturing, purchasing, selling and leasing articles of manufacture, instruments, electrical devices and machines, and owning, controlling and working of letters patent under such articles and machines; incorporators: Chas. O. Johnson, Frederick E. Taylor, Jno. F. Bower. Address letters care of Jno. F. Bower, 5127 Sherman st., Chicago, Ill.

New Construction:—

Paxton & Vierling, of Omaha, Neb., will spend $50,000 on a new foundry and on other improvements to their plant.

The Peck, Stow & Wilcox Co., Southington, Conn., are considering the erection of a malleable iron plant and a grey iron foundry.

The Eagle Iron Works of Jacob May, Brooklyn, N. Y., will erect a three story brick building that will make the plant 25 x 200 feet.

The Putnam Foundry Co., of Putnam, Conn., expect to put up a new storehouse and pattern shop, their increasing business calling for more room.

The contract has been let for erecting the new plant of the Litchfield Car Works, at Memphis, Tenn. The wheel foundry and soft foundry buildings are 80 x 250 feet.

The Phœnix Iron Co., of Phœnixville, Pa., have the contract for the new machine shop of the Schenectady (N. Y.) Locomotive Works. It will be 368x80 feet and two stories high.

The Janson Iron Co. are erecting a rolling mill at Columbia, Pa., which they expect to have in operation about April 1. The works will have two heating furnaces and two trains of rolls, one 12 and one 18 inch, and will have an estimated annual capacity of about 6,000 gross tons of bar iron and steel. The officers are Joseph Janson, president; Valentine Janson, secretary and treasurer, and Frank Janson, manager.

The Berlin Iron Bridge Co., of East Berlin, Conn., are doing considerable iron bridge work at the present time. Among other contracts, they have 17 signal bridges for the Boston & Maine Railroad; two bridges 200 ft. long for the town of Roxbury, Conn.; a bridge 400 ft. long across the Connecticut river, at Stratford, N. H.; a bridge 350 ft. long at Turner, Me.; a bridge 200 ft. long at Houlton, Me., and a bridge 200 ft. long at Moosup, Conn.

Within 30 days work will begin on a new sheet mill plant at Niles, O., in which R. G. Sykes, owner of the Sykes Iron & Steel Roofing Works, will have the principal interest. Mr. John Warner, Jr., who has been assistant superintendent of the Falcon Iron & Nail Co., will be associated with Mr. Sykes. A company will be formed with $100,000 capital. Seven acres of land, formerly the site of the Andrews Bros. & Co.'s mill, now at Haselton, have been purchased. Mr. Sykes' proposition to build two sheet mills, with all necessary appliances, and to employ 75 men within six months provided the Council of Niles would issue bonds to him in the sum of $10,000, which he agreed to take at not less than par, has been accepted. The output of the plant will be 4,000 tons of steel sheets a year, and this will be used for roofing purposes, the Sykes roofing plant at Niles and one at Chicago being expected to consume nearly all the output of the mill.

Fires and Accidents:—

The repair shops of the Cleveland (O.) Electric Co. burned down March 21, with valuable machinery and a number of motors. The loss is $50,000.

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Additions, Enlargements, Removals, Etc.:—

The plans long in contemplation by the Cramps at Philadelphia for the extension of their mammoth shipyards have been contingent upon the action of the Philadelphia Councils making changes in a number of highways in Kensington and vicinity. These were designed chiefly to permit the Cramps to secure more territory so as to make the additions. At a meeting last week, the surveys committee of Councils decided to report in favor of the improvement and there is little doubt that the action of Councils will sanction it.

General Industrial Notes:—

Puddling is being done at the Clinton mill, Pittsburg, by colored men for $3.25 a ton.

The South Milwaukee Land Co. is considering an offer to locate a large iron foundry there.

The Reeves Iron Co., Canal Dover, O., have closed down their sheet mills to replace the bed plate.

Puddlers employed at the Benwood Iron Works of the Wheeling Steel & Iron Co. have agreed to accept $4.

Marshaltown, Ia., Iron Works have started up with 500 hands. A Philadelphia syndicate succeeds the receiver.

Peddlers at the Cohoes, N. Y., Rolling Mill have returned to work at $3 a ton. The firm gives helpers 10 cents a ton extra.

The output of the Pennsylvania Steel Co.'s Steelton, Pa., plant reached high water mark for '94 in the third week in March.

The Cleveland Twist Drill Co. have just furnished the celebrated U. S. Cruiser "Columbia" with a full complement of twist drills and tools.

The blast furnace of the Junction Iron Co., Mingo Junction, O., is again in operation. The plate mills and cut nail factory will work up orders on hand.

The iron roof for the new car barn for the Colonial Electric Street Railway Co., of Kingston, N. Y., will be furnished by the Berlin Iron Bridge Co., of East Berlin, Conn.

No. 1 stack of the Carrie Furnace Co., at Rankin Station, Pa., has been put in operation, after being completely remodeled and rebuilt. It is 18½ feet bosh and 90 feet high.

The Phœnix Iron Works, Cleveland, are well filled up with orders, and for the first time in the history of the works a double force is employed and night work is being done.

The Birmingham (Ala.) Rolling Mill Co.'s plant has resumed after an eight months' shut down. The mill is now rolling billets and slabs into bars, plates and light-section rails.

The Dunbar, Pa., furnace is now turning out 200 tons of metal per day, and doing better work than it has done for years. The common laborers are being paid 10 cents an hour.

The Canonsburg (Pa.) Iron & Steel Mill Co. fired up last week for the manufacture of terne plate, and will eventually dip bright tin. The factory will have a capacity of 72 boxes a day.

The Crowley Car Coupler Co. recently organized at Youngstown, O., have received an offer from the citizens of Struthers, O., to erect a plant for the manufacture of couplers at that place.

The Lake Shore & Michigan Southern Railroad Co. will consolidate their shops for the building of locomotives, coaches and freight cars under one roof, as soon as a location has been decided upon.

At Harrisburg, in the case of Jones & Laughlin, Ltd., of Pittsburg, who appealed against a tax on capital stock, Judge Simonton ordered that the firm pay the Commonwealth $1,400 in addition to taxes already paid.

The Sebastian-May Co., of Sidney, O., have considerably enlarged their capacity by recent changes. Late shipments include a lathe to China; seven to Pilacencia, Spain; one to Buenos Ayres, and one to London.

McIntosh, Hemphill & Co., Pittsburg, have the contract for the new 28-inch blooming mill for which ground has been broken at the Homestead Steel Works, and for a 38-inch blooming mill at Duquesne and a 42x60 engine.

At the Indiana Iron Co.'s plant at Muncie, Ind., no puddling is being done. The 8-inch and 10-inch mills are operating and six scrap furnaces and four swarth furnaces make an output of about 70,000 pounds per turn. Steel billets are worked in the guide and 10-inch mills.

The Vulcan Iron Co., Ltd., New Castle, Pa., manufacturers of rolling mill machinery, have added a boring mill and a large sized draw head shaper made by the Morton Mfg. Co., of Muskegon, Mich., and some new wood working tools have also been placed in their pattern shop.

The Altoona Mfg. Co., of Altoona, Pa., manufacturers of engines, report to their Western agents, Messrs. Fisher & Porter, 1025 Monadnock Block, Chicago, that they have lately received a number of large orders which will necessitate their running full single turn in order to keep pace with them.

Duluth papers state that James E. York, of the Ironton Structural Steel Co., has been in New York figuring on a contract to be let by the Manhattan Elevated Railway for another

system of tracks. These call for beams 30 inches wide and the Ironton Structural Steel Co.'s mills are the only ones equipped for such a contract.

The Lodge & Davis Machine Tool Co., of Cincinnati, are building for the Card Electric Motor & Dynamo Co., of the same city, one of their large standard engine lathes to be driven by electricity. The motor will be placed in the headstock taking the place of the usual cone pulley, and attached direct to the live spindle.

The Valentine Iron Co., of Bellefonte, Pa., whose "Nittany" pig, from ores mined at their own banks, is well known among foundrymen, will blow in their furnace April 2. It has been idle since Aug. 23. They express the belief that the market for No. 1 foundry pig has reached bottom and that the trade is ready to buy at fair living prices, in moderate quantities.

Messrs. Fisher & Porter, 1025 Monadnock Block, Chicago, have just secured the contract to supply two 75 h. p. M. A. Green engines, for which they are Western agents, for the Leland Hotel in Chicago, and have several other contracts of a similar nature nearly closed. They also have a contract to furnish Kotine, the new material for painting iron, for the new Lincoln Park bridge in Chicago, recently erected by the Pittsburg Bridge Co.

Within the next few weeks the Chicago office of Warren Webster & Co., manufacturers of feed water heaters and purifiers will be removed from its present location, No. 2 Canal st., to room 1502 Monadnock Block, where larger and better quarters have been secured. Mr. Wm. D. Pickels, manager of the Chicago office of this company, reports business as being very much improved, and states that he has recently closed some large orders for his company.

Rates to California Greatly Reduced.

The Mid-winter Fair at San Francisco and the numerous other attractions at the Wonderland beyond the Rocky Mountains can be enjoyed by persons of limited means as the Round Trip Rate has again been materially reduced via Pennsylvania Lines. Passengers can select any of the several routes from Chicago and St. Louis, and the return limit is ample for a satisfactory sojourn. For details, apply to F. Van Dusen, Chief Assistant General Passenger Agent, Pittsburg, Penna.

THE P., C., C. & St. L., or Pan Handle route, is a favorite one from Pittsburg to Columbus and Cincinnati, giving at the latter city excellent connections for Southern and Western points. The train leaving Pittsburg at 10:25 P. M. lands the traveler in Cincinnati early the following morning. By a new service which is in contemplation, between New Castle, Pa., and Newcomerstown, O., using the Cleveland & Marietta between Canal Dover and Newcomerstown, the Pennsylvania Co. propose to shorten by 50 miles the route between Buffalo and Columbus and Cincinnati.

MR. W. E. JANES, Chicago agent of the Ames Iron Works of Oswego, N. Y., with office at 18 S. Canal st., reports a great improvement in trade in the past few weeks. Mr. Janes has recently secured for his company several good sized orders for engines and boilers.

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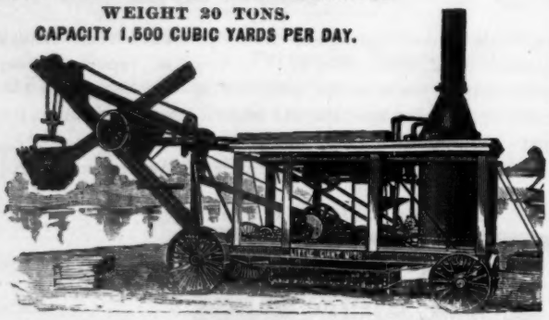

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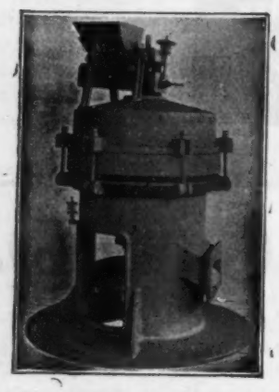

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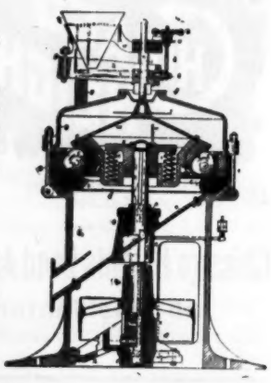

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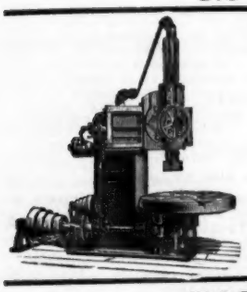

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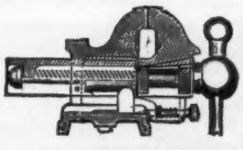

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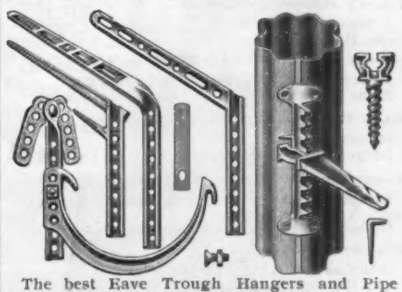

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Toledo Tool & Machine Co., Toledo, O.
Cleveland Stamping & Tool Co., Cleveland, O.

Ejectors—
James Jenks, Detroit, Mich.

Elevators—
Lane & Bodley Co., Cincinnati, O.

Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill.

Emery and Corundum Wheels—
J. Wendell Cole, Columbus and Chicago.
Acme Safety Emery Wheel Co., Detroit, Mich.

Eave Troughs and Conductors—
Berger Mfg. Co., Canton, O.
Berger Bros., Philadelphia, Pa.

Engravers and Electrotypers—
Eclipse Electrotype & Engraving Co., Cleveland.
Union Electrotype Foundry, Cleveland.

Engines (Gas)—
Otto Gas Engine Works, Philadelphia, Pa.
Van Dusen Gas Engine Co., Cincinnati, O
Weber Gas & Gasoline Engine Co., Kansas City, Mo.
Hicks Gas Engine Co., Cleveland, O.

Engineers' Specialties—
James Jenks, Detroit, Mich.

Engines (Steam)—
Wm. Tod & Co., Youngstown, O.
E. H. Jones & Co., Cleveland.
Lane & Bodley Co., Cincinnati, O.
L. Spence & Son, Martins Ferry, O.
Weston Engine Co., Painted Post, N. Y.
Brightman Stoker Co., Cleveland, O.
Wells Engine Co., New York City.
The Brownell & Co., Dayton, O.
Armstrong Bros., Springfield, O.

Engineers and Contractors—
E. H. Jones & Co., Cleveland.
Brightman Stoker Co., Cleveland, O.
Richard A. Parker, Marquette, Mich.
Artificial Gas Engineering Co., Pittsburg, Pa.

Exhaust Heads—
W. C. Lyman, Chicago, Ill.

Explosives—
Hercules Powder Co., Cleveland.

Fans—
Connersville Blower Co, Connersville, Ind.
Buffalo Forge Co., Buffalo, N. Y.

Files, Makers of—
E. K. Morris & Co., Cincinnati, O.
Arcade File Works, Anderson, Ind.

Fire Brick and Clay—
J. Downerd & Son Co., Zanesville, O.
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Garden City Sand Co., Chicago, Ill.
Geo. H. Anderson & Co., Pittsburg, Pa.
Westmoreland Fire Brick Co., Pittsburg, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
American Fire Brick & Clay Co., Mineral Point, Ohio.

Fire Equipment—
Buffalo Fire Equipment Co., Buffalo, N. Y.

Foot and Power Lathes—
Prentiss Tool & Supply Co., Chicago, Ill.
W. F. & John Barnes Co., Rockford, Ill.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.

Foundries—
Harn, Ow & Co., Beaver Falls, Pa.
Addyston Pipe & Steel Co., Cincinnati, O.
Radford Pipe & Foundry Co., Cincinnati, O.
Lane & Bodley Co., Cincinnati, O.
Brightman Stoker Co., Cleveland, O.
The Lloyd-Booth Co., Youngstown, O.
Taylor & Boggis Foundry Co., Cleveland, O.
Lake Shore Iron Works, Marquette, Mich.
Wm. Tod & Co., Youngstown, O.
S. Freeman & Sons Mfg. Co., Racine, Wis.

Foundry Supplies—
J. Downerd & Co., Zanesville, O.
Garden City Sand Co., Chicago, Ill.
Detroit Foundry Equipment Co., Detroit, Mich.
Greiner Economical Cupola Co., Chicago, Ill.
Anti-Chill Core Compound Co., Peoria, Ill.
American Fire Brick & Clay Co., Mineral Point, Ohio.

Forgings—
Cleveland City Forge & Iron Co., Cleveland.

Fuel Oil Burners—
John R. Armstrong Co., Chicago, Ill.

Furnace Linings—
Union Mining Co., Mt. Savage, Md.
American Fire Brick & Clay Co., Mineral Point, Ohio.

Friction Clutch Pulleys—
J. H. & D. Lake Co., Massillon, O.

Galvanizers—
H. H. Hodell, Cleveland.

Grindstones—
E. K. Morris & Co., Cincinnati, O.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City, N. J.

Hangers, Pulleys and Shafting—
Lane & Bodley Co., Cincinnati, O.
J. H. & D. Lake Co., Massillon, O.

Heaters and Purifiers—
Stilwell & Bierce Manufacturing Co., Dayton, O.
E. H. Jones & Co., Cleveland.
Brightman Stoker Co., Cleveland, O.

Heavy Hardware—
E. K. Morris & Co., Cincinnati, O.

Hoisting Engines—
Lake Shore Iron Works, Marquette, Mich.
Vulcan Iron Works Co, Toledo, O.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

Injectors—
Eagle Lubricator Co., Cleveland, O.
James Jenks, Detroit, Mich.

Investments—
Frank R. Biedler, Baltimore, Md.
Fidelity & Deposit Co., Baltimore, Md.
Geo. Pemberton, New York.

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Berger Bros., Philadelphia, Pa.

Iron Nails and Steel—
Weber & Co., Cincinnati, O.
G. B. Schulte Sons Co., Cincinnati, O.
Geo. H. Sibell & Co., Chicago, Ill.

Iron and Steel Wire—
Trenton Iron Co., Trenton, N. J.

Iron Ore, Bar and Pig Iron—
Oglebay, Norton & Co., Cleveland.
J. H. Outhwaite & Co., Cleveland.
Condit-Fuller Co., Cleveland.
E. C. Pope, Cleveland.
Geo. H. Sibell & Co., Chicago, Ill.

Iron Working Tools—
John Adt & Son, New Haven, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Cleveland Twist Drill Co., Cleveland, O.
Cleveland Stamping & Tool Co., Cleveland, O.
Cincinnati Milling Machine Co., Cincinnati, O
Prentiss Tool & Supply Co., Chicago, Ill.
A. P. Quint, Hartford, Conn.
Toledo Machine & Tool Co., Toledo, O.
W. F. & John Barnes Co., Rockford, Ill.
H. Bickford, Lakeport, N. Y.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.
The Billings & Spencer Co., Hartford, Conn.

Ladles—
Detroit Foundry Equipment Co., Detroit, Mich.

Land Companies—
Chicago Heights Land Association, Chicago, Ill.

Lathes—
Prentiss Tool & Supply Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
W. F. & John Barnes Co., Rockford, Ill.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.

Laundry Machinery—
Chicago Laundry Machine Co., Chicago, Ill.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.

Machinists' Tools and Supplies—
Cincinnati Milling Machine Co., Cincinnati, O
Prentiss Tool & Supply Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O
W. F. & John Barnes Co., Rockford, Ill.
H. Bickford, Lakeport, N. Y.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.

Machine Screws—
Illinois Screw Co., Chicago, Ill.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
Harn, Ow & Co., Beaver Falls, Pa.

Mining Machinery—
Lake Shore Iron Works, Marquette, Mich.
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Vulcan Iron Works Co., Toledo, O.
American Mining & Machinery Co., Cleveland.

Moulding Sand—
Garden City Sand Co., Chicago, Ill.
J. Downerd & Son Co., Zanesville, O.

Municipal Bonds—
Frank R. Biedler, Baltimore, Md.

Milling Machines—
Cincinnati Milling Machine Co., Cincinnati.
Prentiss Tool & Supply Co., Chicago, Ill.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.

Mines and Mining Stock—
Frank R. Biedler, Baltimore, Md.

Mining Engineers—
Richard A. Parker, Marquette, Mich.

Oil Tanks—
The J. C. McNeil Co., Akron, O.

Ore Crushers—
Lake Shore Iron Works, Marquette, Mich.
American Mining & Machinery Co., Cleveland.

Paint—
Iron Clad Paint Co., Cleveland
Jos. Dixon Crucible Co., Jersey City, N. J.
Berger Bros., Philadelphia, Pa.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago.
Hendrick Mfg. Co., Ltd., Carbondale, Pa.

Plumbers' and Gas Fitters' Supplies—
Berger Bros., Philadelphia, Pa.

Powder—
Hercules Powder Co., Cleveland.

Power Plants—
Weston Engine Co., Painted Post, N. Y.

Presses—
Toledo Machine & Tool Co., Toledo, O.
Cleveland Stamping & Tool Co., Cleveland, O.

Planers—
Prentiss Tool & Supply Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
W. H. Robertson, Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.

Portable Forges—
Foos Mfg. Co., Springfield, O.
Buffalo Forge Co., Buffalo, N. Y.

Portable Engines and Boilers—
Armstrong Bros., Springfield, O.

Pulleys—
Lane & Bodley Co., Cincinnati, O.
J. H. & D. Lake Co., Massillon, O.

Power Hammers—
W. H. Robertson, Chicago, Ill.

Pulverizing Machinery—
Lake Shore Iron Works, Marquette, Mich.
American Mining & Milling Machinery Co., Cleveland, O.

Pumps (Steam)—
E. H. Jones & Co., Cleveland.
Brightman Stoker Co., Cleveland, O.

Radial Drills—
Bickford Drill & Tool Co., Cincinnati, O.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.

Rock Breakers—
Lake Shore Iron Works, Marquette, Mich.
American Mining & Machinery Co., Cleveland.

Rolling Mill Machinery—
The Lloyd-Booth Co., Youngstown, O.

Roofing (felt)—
Berger Bros., Philadelphia, Pa.
Consolidated Roofing Works, Columbus, O.

Rust Preventative—
Stevenson Bros. & Co., Philadelphia, Pa.

Sand and Chill Rolls—
The Lloyd-Booth Co., Youngstown, O.

Saws—
Peter Gerlach & Co., Cleveland.

Screws—
Illinois Screw Co., Chicago, Ill.

Schools—
Correspondence School of Mechanics, Scranton, Pa.

Second-Hand Machinery—
Prentiss Tool & Supply Co., Chicago, Ill.
Hill, Clarke & Co., Chicago, Ill.
W. H. Robertson, Chicago, Ill.
Chicago Laundry Machine Co., Chicago, Ill.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Smokeless Furnaces—
Brightman Stoker Co., Cleveland, O.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Berger Bros., Philadelphia, Pa.

Steam Shovels and Dredges—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Vulcan Iron Works Co., Toledo, O.

Scrap Iron & Steel—
Klein & Cohn, Cincinnati, O.

Stand Pipes—
The J. C. McNeil Co., Akron, O.

Steel—
Wm. Jessop & Sons, Ltd. New York, N. Y.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.
James Murdock, Jr., Cincinnati, O.

Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa.
Wm. Jessop & Sons, Ltd., New York, N. Y.
King & Andrew Co., Chicago, Ill.

Stokers—
Brightman Stoker Co., Cleveland, O.

Special Machinery—
Toledo Machine & Tool Co., Toledo, O.
Cleveland Stamping & Tool Co., Cleveland, O.

Smoke Consumer—
Brightman Stoker Co., Cleveland, O.

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.

Screens for Coal, Ore Etc—
Hendrick Mfg. Co Ltd., Carbondale, Pa.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.

Tanks—
S. Freeman & Sons Mfg. Co., Racine, Wis.

Tinners' Hardware—
Berger Bros, Philadelphia, Pa.

Tinning Machinery—
The Lloyd-Booth Co., Youngstown, O.

Tool Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.

Tramways—
Trenton Iron Co., Trenton, N. J.

Trucks—
Detroit Foundry Equipment Co., Detroit, Mich.

Tumblers—
Detroit Foundry Equipment Co., Detroit, Mich

Turret Drills—
A. P. Quint, Hartford, Conn.

Twist Drills—
Cleveland Twist Drill Co., Cleveland.

Valves—
The Lunkenheimer Co., Cincinnati, O.
Berger Bros., Philadelphia, Pa.

Valve Gears—
Geo. Marshall, Fremont, Neb.

Vises—
Capital Machine Tool Co., Auburn, N. Y.

Ventilating Fans—
E. H. Jones & Co., Cleveland.
Brightman Stoker Co., Cleveland, O.

Washers—
Milton Mfg. Co., Milton, Pa.

Water, Gas and Steam Pipe—
Addyston Pipe & Steel Co., Cincinnati, O.
Radford Pipe & Foundry Co., Cincinnati O.

Well Drilling Machinery—
Williams Bros., Ithaca, N. Y.

Wheelbarrows—
Kilbourne & Jacobs Mfg. Co., Columbus, O.

Wire Fence Ratchets—
J. Stauffer, Dayton, O.

Wire Rope—
Trenton Iron Co., Trenton, N. J.

Wire Machinery—
John Adt & Son, New Haven, Conn.

Wood-Working Machinery—
J. A. Fay & Egan Co., Cincinnati, O.

NOW is the time to INVEST in

SOUTHERN TIMBER-MINERAL LANDS,

Before prices advance. All kinds of mines for sale.

E. C. ROBERTSON,
Terms Easy. CINCINNATI, O. Titles Perfect

Investigate the

"Lunken" Renewable Seat Gate Valve.

A revelation in the valve industry.

Simple, Strong, Compact, Durable, Low-Priced.

Its adoption saves

Time, Labor, Money.

First-class and warranted.

3″ and larger with balanced disk, suitable for heavy pressure.

Specify and order from your dealer, or send for circulars and prices.

THE LUNKENHEIMER CO.,
CINCINNATI, O., U. S. A.

Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
* Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7.45 am	†11.55 am
Pittsburgh, Bellaire and East	†12.45 pm	† 6.25 pm
Philadelphia and New York	* 1.40 pm	*11.15 am
Baltimore and Washington	* 1.40 pm	*11.15 am
Alliance and Pittsburgh	* 1.40 pm	*11.15 am
Ravenna and Alliance	† 3.25 pm	† 9 50 am
Hudson and Ravenna	* 5 .0 pm	* 8.25 am
Philadelphia and New York	*11.10 pm	* 5.25 am
Baltimore and Washington	*11.10 pm	* 5.25 am
Alliance and Pittsburgh	*11.10 pm	* 5.25 am

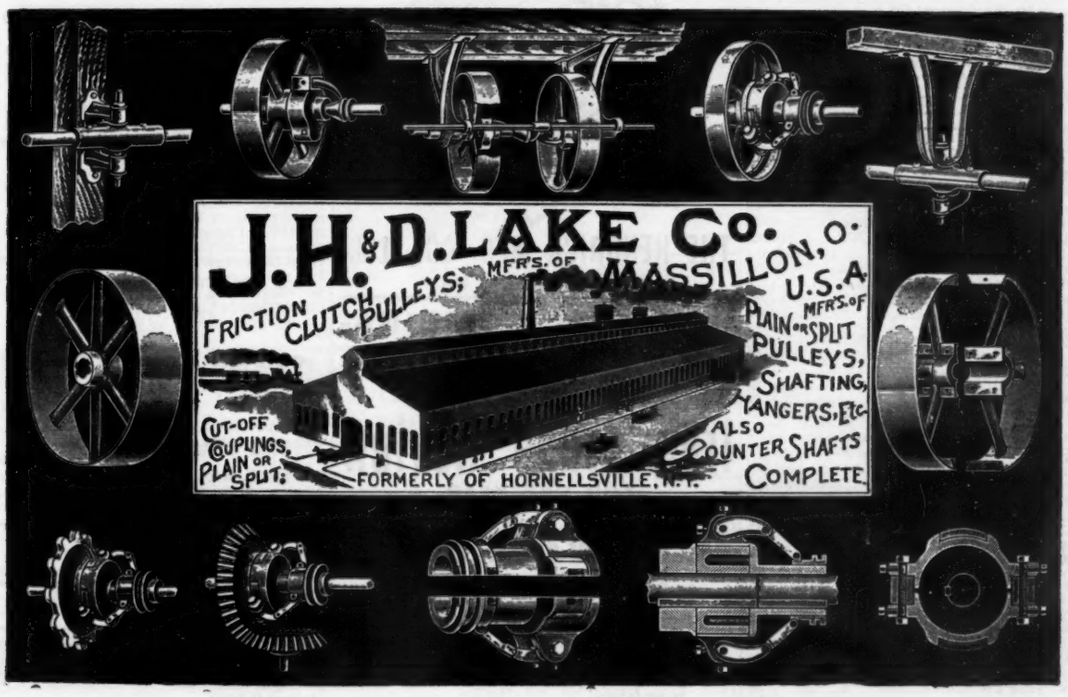
Mt. Vernon and Pan-Handle Route.

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8.40 am	* 5.25 pm
Akron, Columbus & Zanesville	12.45 am	*11.55 pm
Akron and Columbus	* 2.40 pm	*5.25 pm
Akron and Orrville	† 3.25 pm	† 9.50 am
Columbus and Cincinnati	* 8.00 pm	* 7.00 am

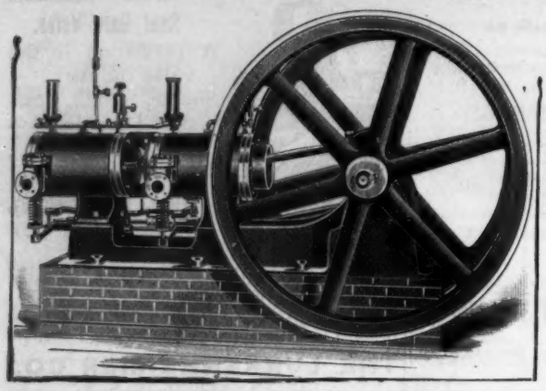
Valley Ry. | Depot foot of So. Water St. City Office 143 Superior St.

	Arrive.	Depart.
Akron & Canton	*6:40 P M	*7:10 A M
Akron, Canton & Valley Jctn.	*10:10 A M	*3:15 P M
Valley Jctn. & Way Stations	†6:40 P M	†7:10 A M
Akron, Canton & Chicago	*8:00 A M	*6:30 P M
Wooster and Garrett	†3:00 P M	†11:00 A M
Wooster	.....	*6:30 P M
Akron, Canton & Marietta	†3:00 P M	†11:00 A M
Steubenville, Wheeling, Washington, D. C., and Baltimore	†3:00 P M	†11:00 A M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule Compartment Sleeping cars between Cleveland and Chicago.


J.H. & D. LAKE CO.
MFR'S. OF
MASSILLON, O. U.S.A.
FRICTION CLUTCH PULLEYS;
PLAIN OR SPLIT PULLEYS, SHAFTING, HANGERS, ETC.
ALSO COUNTER SHAFTS COMPLETE
CUT-OFF COUPLINGS, PLAIN OR SPLIT;
FORMERLY OF HORNELLSVILLE, N.Y.

HICKS GAS and GASOLINE ENGINES.



Latest and the best and the Gas and Gasoline Engine of the future. By its construction we get double the power from the same number of parts and weight as are used in the ordinary gas engines, thus enabling us to reduce the price to compete with steam engines, and as much better than the ordinary gas engine as the Corliss steam engine is better than the common slide valve of 20 years ago. Two to one hundred H. P. both vertical and Horizontal.

Write for Catalogue.

HICKS GAS ENGINE COMPANY,
CLEVELAND, OHIO.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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Westmoreland Fire Brick Co	23
Weston Engine Co	1
*Williams Bros.	28

PERFORATED SHEET METALS

OF EVERY DESCRIPTION,

FOR SCREENING PURPOSES.

THE HENDRICK MFG. CO., Ltd.,
CARBONDALE, PA.

A SPECIAL COMBINATION PRICE ON THE Iron Trade Review

FOR ONE YEAR,

in connection with

West's Molder's Text-Book,
Bolland's Iron Founder,
Bolland's Iron Founder Supplement

or any of the popular magazines.

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	3.00@ 3.35
No. 1 Bessemer hematite	2.75@ 3.00
Hematites No. 1 non-Bessemer	2.25@ 2.50
No 1. Specular, non-Bessemer	2.50@ 3.00

PIG IRON.

CLEVELAND (f. o. b. cars):

Bessemer	$10 40@$10 60
No. 1 Strong Foundry	11 25@ 11 75
No. 2 Strong Foundry	10 25@ 10 75
No. 1 Grey Forge, red short	9 75@ 00 00
No. 2 Gray Forge, neutral	9 50@ 00 00
No. 1 American Scotch	11 65@ 12 00
No. 2 American Scotch	11 00@ 11 50
Lake Superior Charcoal	14 00@ 15 00

PITTSBURG:

No. 1 Foundry	$11 25@$11 75
No. 2 Foundry	10 50@ 11 00
Grey Forge	9 50@ 9 60
White and Mottled	9 00@ 9 25
Warm Blast Charcoal	18 00@ 19 00
Cold Blast Charcoal	22 00@ 26 00
Bessemer	10 50@ 00 00

CHICAGO (reported by our representative:)

Lake Superior Charcoal	$15 00@$15 50
Local Coke Foundry No. 1	11 75@ 12 25
Local Coke Foundry No. 2	11 25@ 11 75
Local Coke Foundry No. 3	11 00@ 11 50
Local Scotch Foundry No. 1	12 00@ 12 50
Local Scotch Foundry No. 2	11 75@ 12 25
Local Scotch Foundry No. 3	11 25@ 11 75
Southern Coke No. 1	11 75@ 12 00
Southern Coke No. 2	11 00@ 11 25
Southern Coke No. 3	10 75@ 11 00
Southern No. 1 Soft	11 00@ 11 25
Southern No. 2 Soft	10 75@ 11 00
Southern Silveries No. 1	12 50
Southern Silveries No. 2	11 75
Southern Gray Forge	10 00@ 10 25
Jackson Co. Silveries	15 00@ 16 00
Ohio Silveries No. 1	14 50
Ohio Silveries No. 2	13 00
Ohio Strong Softeners	13 00@ 13 25
Alabama Car Wheel	18 25@ 18 60
Southern Charcoal No. 1	15 50@ 16 00
Southern Charcoal No. 2	15 00@ 15 50

CINCINNATI (reported by Rogers, Brown & Co.)

Southern Coke No. 1, Foundry	$11 00@$11 25
Southern Coke No. 2 and No. 1 Soft	10 00@ 10 25
Hanging Rock Coke, No 1	12 50@ 13 00
Hanging Rock Charcoal No. 1, Fdy	16 00@ 17 00
Tennessee Charcoal No 1	14 00@ 14 50
Jackson County Stone Coal No 1	14 50@ 16 00
Southern Coke, Grey Forge	9 50@ 9 75
" " Mottled	9 25@ 9 50
Standard Alabama Car Wheel	16 75@ 17 50
Tennessee " "	16 00@ 16 50
Lake Superior " "	16 50@ 17 00

BUFFALO (reported by Rogers, Brown & Co.)

Mahoning and Shenango Valley, strong, No. 1 Foundry	$12 00
Mahoning and Shenango Valley, strong, No. 2 Foundry	11 50
Ohio Softener No. 1	12 00
Ohio Softener No. 2	12 75
Jackson Co. Silvery, No. 1	$15 50@ 17 00
Jackson Co. Silvery No. 2	15 00@ 16 00
Lake Superior Charcoal	14 75
Tennessee Charcoal	15 50
Southern Softener No. 1	12 25
Alabama Car Wheel	16 00@ 17 50
Hanging Rock Charcoal	18 50

LOUISVILLE (reported by Geo. H. Hull & Co.)

Southern Coke No. 1 Foundry	$11 50@$12 00
Southern Coke No. 2 Foundry	9 50@ 10 00
Southern Coke No. 3 Foundry	9 00@ 9 25
Grey Forge	8 75@ 9 00
Spathite	11 75@ 12 25
Southern Charcoal No. 1 Foundry	13 00@ 14 00
Car Wheel	15 50@ 16 00

ST. LOUIS (reported by Rogers, Brown & Meacham):

Southern Coke No 1	$11 50@$11 75
Southern Coke No. 2	10 50@ 10 75
Southern Coke No. 3	10 25@ 10 50
Southern Grey Forge	10 00@ 10 25
Southern Charcoal No. 1	15 50@ 16 00
Missouri Charcoal No. 1	12 00@ 12 50
Ohio Softeners	14 50@ 15 00
Lake Superior	16 50@ 17 00
Southern	17 00@ 17 50
Connellsville Coke, St. Louis	4 50

OLD RAILS AND SCRAP METAL.

[Prices paid by mills.]

	Gross Tons
Old iron rails	$13 00
Old steel rails	10 50
	Net Tons
No. 1 R. R. wrought scrap	$10 00
No. 1 wrought scrap	9 50
No. 1 Machine cast scrap	8 50
Iron axles	15 50
Axle turnings	8 00
Wrought turnings (free from cast)	7 00
Cast borings	5 00
Uncut wrought iron boilers	4 00
Steel boiler plates	9 00
Grate bars	4 00
Pipes and flues (clean)	7 00
Tank iron	6 75
Hoop and band iron	5 00
Sheet iron	5 00
Wrought drillings	6 50
Malleable iron	7 50

Frank P. Cady, Pres. and Supt.
Geo. H. Bowler, Sec'y and Treas.

THE CADY MFG. CO.

283 W. River St., CLEVELAND, O.

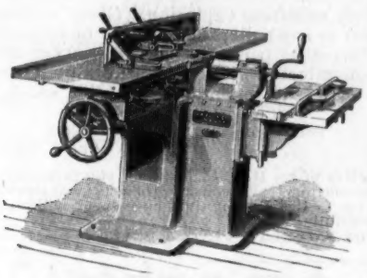
Power Presses, Dies,
Drop Hammers, Punches and
Shears, Special Machinery,
Wire Cutters and Straighteners.

J. A. FAY & CO.

286 to 306 W. Front St.,
CINCINNATI, OHIO,
U. S. A.

WOOD-CUTTING MACHINERY
FOR ANY PURPOSE.

MAKERS, INTRODUCERS AND ORIGINATORS.



NO. 2 VARIETY WOOD-WORKER.

The infinite variety of work performed by this machine has given it the position as the most useful one in existence for the working of wood. It is simply invaluable, for it is capable of almost every operation known to the art.

THE LONG LINE OF AWARDS, FROM 1851 DOWN TO THE "GRAND PRIX" AT PARIS, 1889, HAS BEEN ADDED TO BY THE CAPTURE OF THE "GRAND HONORS" AT THE WORLD'S FAIR, CHICAGO, 1893.

PATTERN AND FLASK MAKING
MACHINERY, ETC., SUPPLIED.

The latest and most advanced ideas for fast, perfect and reliable productions.

PERFORATED METALS
OF ALL KINDS FOR
MILLING MINING AND
AGRICULTURAL MACHINERY,
PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.
LARGE AND VARIED ASSORTMENT OF SIZES. CORRESPONDENCE SOLICITED.
THE ROBERT AITCHISON. PERFORATED METAL CO.,
OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.

H. LEITCH, PRES JOHN C. LEITCH, SEC. AND GENL. MAN. JOHN A. WILSON, TREAS

WESTMORELAND FIRE BRICK CO.
MANUFACTURERS OF HIGH GRADE
FIRE BRICKS.
PITTSBURG, PA.

Horse AND Mule Shoes
SHEETS, BARS, SLABS AND BILLETS.
Light Sheets for TINNING AND PERFORATING a Specialty.
Geo. H. Sibell & Co., 614-218 La Salle St., Chicago.

IRON CLAD PAINT CO.
Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g,
CLEVELAND, OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE
Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. mill)	1.20C@1.30C
Angles	1.25C@1.35C
Tees	1.35C@1.45C
Universal Plates	1.25C
Sheared Plates	1.35C

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 60
1½ to 6 by ⅜ to 1 inch	1 65
1½ to 6 by 1¼ to 2 inch	1 80
1¼ & 1⅜ by ⅜ to ¾ inch	1 65
1 & 1⅛ by ⅜ to ¾ inch	1 70
⅝, ¾, ⅞, by ⅜ to ⅝ inch	1 80

Round and Square.

1 to 1⅜ inch	1 60
2 to 2⅜ inch	1 70
2¼ to 3¼ inch	1 85
3⅜ to 4 inch	2 10
4¼ to 4½ inch	2 70
4¾ to 5 inch	2 90

Oval.

⅜ to 1¼ inch	1 80
⅝ to ¾ inch	1 80
½	2 00
⅜	2 20

Half Oval and Half Round.

1⅛ to 3 inch	2 15
⅞ to 1⅛ inch	1 95
⅝ to ¾ inch	2 20
½	2 35
⅜	3 45

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 70
1 to 1¾ by ¼ and 5-16 inch	1 75
¾ to ⅞ by ¼ and 5-16 inch	1 85
⅛ to ⅝ by ¼ and 5-16 inch	2 10

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	2 15
1 7-16 to 2, No. 17, 18 and 19	2 20
1 7-16 to 2, No. 20	2 30
1 7-16 to 2, No. 21	2 40
1 7-16 to 2, No. 22	2 50
1⅛ to 1⅜, No. 13, 14 and 15	2 20
1⅛ to 1⅜, No. 16, 17 and 18	2 25
1⅛ to 1⅜, No 19 and 20	2 30
1⅛ to 1⅜, No. 21	2 40
1⅛ to 1⅜, No. 22	2 50
15-16 and 1 inch, No. 13, 14 and 15	2 25
15-16 and 1 inch, No. 16, 17 and 18	2 30
15-16 and 1 inch, No. 19 and 20	2 40
15-16 and 1 inch, No. 21	2 50
15-16 and 1 inch, No. 22	2 60
⅞, No. 13, 14 and 15	2 40
⅞, No. 16, 17 and 18	2 50
⅞, No. 19 and 20	2 60
⅞, No. 21	2 70
⅞, No. 22	2 80
13-16, No. 13, 14 and 15	2 50
13-16, No. 16, 17 and 18	2 60
13-16, No. 19 and 20	2 70
13-16 No. 21	2 80
13-16, No. 22	2 90
¾, No. 13, 14 and 15	2 60
¾, No. 16, 17 and 18	2 75
¾, No. 19 and 20	2 85
¾, No. 21	2 95
¾, No. 22	3 05
11-16, No. 13, 14 and 15	2 85
11-16, No. 16, 17 and 18	2 90
11-16, No. 19 and 20	3 00
11-16, No. 21	3 10
11-16, No. 22	3 20
11-16, No. 23	3 30
⅝, No. 13, 14 and 15	2 90
⅝, No. 16, 17 and 18	3 00
⅝, No. 19 and 20	3 10
⅝, No. 21	3 20
⅝, No. 22	3 30
⅝, No. 23	3 40
9-16, No. 13, 14 and 15	3 10
9-16, No. 16, 17 and 18	3 20
9-16, No. and 20	3 30
9-16, No. 21	3 40
9-16, No. 22	3 50
9-16. No. 23	3 60
7-16 and ½ inch, No. 13, 14 and 15	3 30
7-16 and ½ inch, No. 16, 17 and 18	3 40
7-16 and ½ inch, No. 19 and 20	3 50
7-16 and ½ inch, No. 21	3 60
7-16 and ½ inch, No. 22	3 70
7-16 and ½ inch, No. 23	3 80
⅜, No. 13, 14 and 15	3 80
⅜, No. 16, 17 and 18	3 90
⅜, No. 19 and 20	4 00
⅜, No. 21	4 30
⅜, No. 22	4 40
⅜, No. 23	4 55

Light Band.

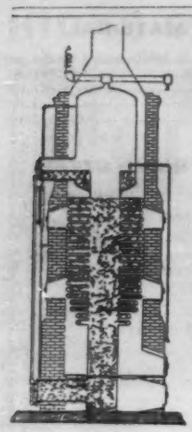
1½ to 6 by ⅛ to 3-16 inch	1 90
1½ to 6 by Nos. 11 and 12	1 95
1 to 1¾ by ⅛ to 3-16 inch	1 95
1 to 1¾ by Nos. 11 and 12	2 00
⅝ and 13-16 by ⅛ to 3-16 inch	2 10
⅝ and 13-16 by Nos. 11 and 12	2 15
¾ and 11-16 by ⅛ to 3-16 inch	2 20
¾ and 11-16 by Nos. 11 and 12	2 25
⅝ and 9-16 by ⅛ to 3-16 inch	2 35
⅝ and 9-16 by Nos. 11 and 12	2 40
½ by ⅛ to 3-16 inch	2 50
½ by Nos. 11 and 12	2 55

Wagon Box Iron.

⅝ inch, beveled edge, by Nos. 11 and 12	2 10
⅝ inch, " " " " 13 and 14	2 20
¾ inch, " " " " 11 and 12	2 25
¾ inch, " " " " 13 and 14	2 45

Sheet Iron.

No. 10	2 15
No. 12	2 20
No. 14	2 25



THE ADAMS
WATER TUBE BOILER.

This Boiler is absolutely safe from explosion. Gives as much steam from the waste heat as any boiler made. Easy of access for cleaning and repairs. Furnishes perfectly dry steam. Occupies little ground space. Economical in first cost. Send for complete circulars giving list of users and testimonials, one of which is printed below.

The Falcon Tin Plate & Sheet Co., }
NILES, O., Aug. 18, 1893. }

Chas. P. Adams, Esq.

Dear Sir: The three boilers of 225 H. P. each which you furnished us are working in every way satisfactory. We consider them as good steamers as any we have ever used. Up to the present time have spent nothing on them for repairs. Very respectfully,

THE FALCON TIN PLATE & SHEET CO.,
By Warner Arms, Pres't.

C. P. ADAMS.
807 The Cuyahoga, - CLEVELAND. O.

THE CYCLONE PORTABLE FORGES

Have Double Ratchet, Solid Frame, Adjustable Legs, Detachable Lever.
Run Lightest, Make Strongest Blast & Last Longest.
ALL DESIRABLE STYLES AND SIZES.
Sold by Hardware and Machinery Dealers everywhere.
Send for Catalogue of these and
Hand & Power Blower, Blacksmith Drill Presses, &c.
THE FOOS MFG. CO. SPRINGFIELD, OHIO.

FUEL OIL BURNERS.

J. R. Armstrong's System of Burning
Crude Petroleum.
WHY IT IS THE BEST.

Send for Catalogue.

JOHN R. ARMSTONG COMPANY,
35 West Monroe St., Chicago, Ill.

PL

DIXON'S PERFECT LUBRICATING GRAPHITE.
The most Marvelous Lubricant Known.
Used Dry, or Mixed with Water, Oil or Grease
NOT AFFECTED BY HEAT, COLD, STEAM OR ACIDS.
An Interesting and Instructive Pamphlet will be sent Free of Charge.
JOS. DIXON CRUCIBLE CO. Jersey City, N. J.

HERCULES POWDER

SEND FOR DESCPUTIVE PAMPHLET.

Stump before a blast. | Fragments after a blast.

HERCULES, THE GREAT STUMP AND ROCK ANNIHILATOR.

STRONGEST and SAFEST EXPLOSIVE Known to the Arts.
POWDER, FUSE, CAPS,
Electric Mining Goods,
AND ALL TOOLS FOR STUMP BLASTING,
FOR SALE BY THE
HERCULES POWDER COMPANY,
710 Cuyahoga Bldg., Cleveland, O.
J. W. WILLARD, Manager.

No. 15-17	2 35
No. 18	2 50
No. 20	2 60
No. 22-24	2 70
No. 25 26	2 80
No 27	2 90

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 00
Shell	2 25
Flange	2 50
Marine Flange	2 75
Fire Box	3 75

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. ℔. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	08
9-16 to ⅞ in. "	08¾
7-16 to ⅝ and 2⅜ to 3 in	09
3⅛ to 4 in	09½
⅝ to 11-16 and 4⅛	10
⅛ to 6 in	10¼
¼ to 9-32 and 6⅛ to 7 in	11
3-16 in	13

Flats.

	cts. lbs.
2 to 9-16 in. wide by 2 to ⅝ thick	8

Bessemer and O. H. Steel.

Machinery	base price, 2 10
Tire	" 2 25
Spring	" 2 50
Sleigh Shoe	" 2 50
Toe Calk	" 2 35
Cutter Shoes, tapered and bent	" 2 75

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 80
Bridge ½, ⅝, 11-16 and ¾ inch diam	3 50

MACHINERY SUPPLY MARKET.

Anvils.

American	℔ lb 9@10
Wright's	℔ lb 12

Bellows.

Blacksmiths' Hill's	dis 40
Blacksmiths' Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single,	dis 40
Munson's Short Lap Single Leather	dis 45
Munson's Short Lap Double and Light Double Leather	dis 50
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis 45

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.,	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 30
Horton's Universal	dis 40
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	℔ 3½
Iron, steel points	℔ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1½"	dis 50&10
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

Emery.

	No. 4 to No. 54 to 46 gr.	Flour, C. F 150 gr.	F. FF.
Kegs, ℔ lb	4½c	5 c	2½c
½ kegs ℔ lb	4¾c	5¾c	2¾c
¼ kegs ℔ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	7½c

FRANK R. BIEDLER,

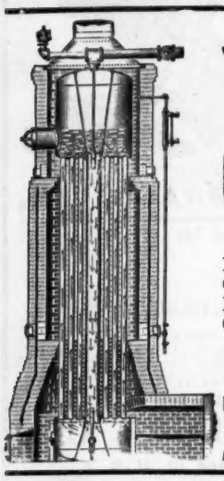
(PRINCIPAL)
Baltimore Offices,
Equitable Building,

(BRANCH)
New York Offices
Welles Building,
18 Broadway.

MINING MINERAL AND TIMBER LANDS.

Municipal Bonds, Large Tracts of Florida
Farm and City Mortgages, Phosphate and
Short Time Paper. Hammock Lands.

EXAMINATIONS AND REPORTS MADE. Correspondence Solicited.



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AKRON, OHIO,

SOLE BUILDERS OF THE

Cook Patent Water Tube Boiler

THE ONLY PERFECT WASTE-HEAT BOILER.

No incrustation.
Generates the greatest amount steam with least amount heat.
Repairs reduced to a minimum.
Can be used equally as well for direct firing or with natural gas.

WE ARE ALSO BUILDERS OF

HORIZONTAL, TUBULAR, AND FLUE BOILERS, OIL TANKS AND WATER STAND PIPES.

Estimates furnished promptly on receipt of specifications.

EUREKA FENCE RATCHET.

SIMPLE, STRONG AND CONVENIENT TO HANDLE.

All parts held together by a pin inside of box; no losing of pawls or rollers. It can be adjusted quickly and be bought cheap. Both large and small sizes. Write for prices and terms. Address,

J. STAUFFER, 1630 East 3d St., Dayton, O.

CLEVELAND ROLLING MILL CO.,

CLEVELAND, - OHIO,

—MANUFACTURERS OF—

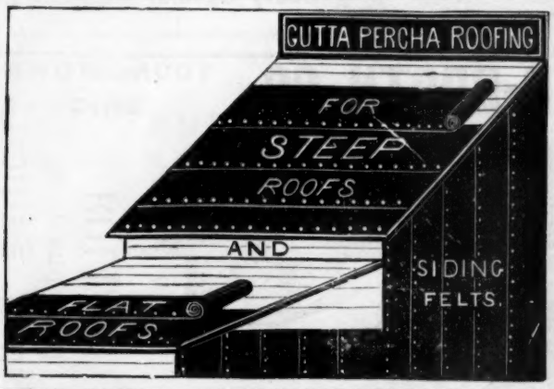
BESSEMER AND OPEN-HEARTH STEEL,

Blooms, Billets, and Slabs, Steel Rails, Steel Beams, Channels and Angles. Steel Forgings, Bar Spring, and Sleigh Shoe Steel. Steel Wire of all kinds. Barbed Wire, Iron and Steel Plates, Galvanized and Black Sheet Iron and Steel Corrugated Iron Roofing.

WORLD'S FAIR AWARD.-

We are the only Steel Roofing Co. awarded Medal and Diploma for **PATENT CAP ROOFING** at World's Columbian Exposition. We are also large manufacturers of all styles of METAL ROOFING, SIDING, CEILING, ETC. Send for Catalogue and Price List. Mention this paper.

SYKES IRON & STEEL ROOFING CO., - Chicago and Niles, O.



BEST AND CHEAPEST

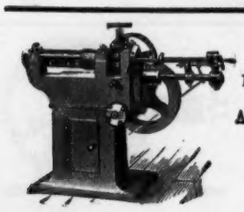
ROOFING

For Iron Works, Foundries, Mills and Factories.

Elastic Paint for Metal Roofs and Siding only 60c. per gallon in bbls.

Send for Catalogue and references from hundreds of the largest Manufacturing firms in the United States. Also Water Proof Siding and Sheathing Paper.

Empire Paint & Roofing Co.,
111 N. Fourth St.,
PHILADELPHIA, PA.

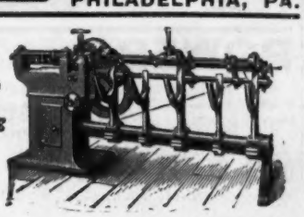


JOHN ADT & SON,

New Haven, Conn.

Builders of Machinery for Hardware Manufacture.

Automatic Wire Straightening and Cutting Machines, Butt Milling Machinery, Butt Drilling Machinery, Riveting Machines, Foot Presses, Screw Cutters, Etc.



Emery Cloth and Paper.

Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

Detroit	dis 55@60
Norton's	dis 55@60
Grant	dis 55@60
Sterling	dis 60
Celluloid	dis 10&33⅓
Northampton	dis 55
Crystal	dis 65@70
Vitrified	dis 60
Vulcanite	dis 60&10
Hamden	dis 60&10
Cyclone	dis 60

Files.

Arcade	dis 60&10@60&10&10
Nicholson	dis 60&10@60&10&10
" X. F.	dis 25
Kearney & Foot	dis 60&10@60&10&10
Black Diamond	dis 60&10@60&10&10
McClellan	dis 60&10@60&10&10
Disston's	dis 65@70
Western	dis 70
Stub's	dis 25
Grobet's	dis 30
Reynolds Bros.' Hand Cut	dis 50
Industry File Works Hand Cut	dis 50

Hammers.

P. S. W	dis 40
Atha new list, Jan. 15, 1887	dis 50
Heavy hammers and sledges under 5 lbs	15c
" " " " over 5 lbs	12c

Jack Screws.

Illinois Bolt Co. list	dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3½	3⅛
Hexagon	15½	11½	8½	6	5¾	5¼	
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887	dis 75
Standard Penny Nails, ₩ keg card rate	
Car lots	$1.55
Less than car lots	$1.65

Oilers.

Zinc and Tin	dis 60
Brass and Copper	dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz	dis 10@10&10

Packing, Steam.

Boston Belting Co	dis 60
American Packing Hemp	₩ lb 9@10
Russia " "	₩ lb 14
Italian " "	₩ lb 13@19
Plumbago Piston	₩ lb 40
Peerless	₩ lb 60
Morrison's "	₩ lb 50
Square Flax "	₩ lb 50
Sheet Rubber	₩ lb 12&24
Excelsior Rubber	₩ lb 48
Rainbow — Full Rolls	45c ₩ lb
Rainbow — Less than Full Rolls	50c ₩ lb
Eclipse Gasket	₩ lb 75

Picks.

Railroads, 5 to 6 lbs	$12 dis 60
" 6 to 7 lbs	$13 dis 60

Pulleys.

Iron Pulleys, Walker List	dis 40
Medart Pulleys	dis 50
Split Wood Pulleys	dis 50@55

Rivets.

Iron, Thousand, list November 17	dis 50&10@60
Iron, Ordinary, Cooper's Block and Carriage list November 17	dis 50&10@60
Copper	dis 50@50&10

Saws.

Disston's Circular	dis 40&10
" Band	dis 25
" Scroll	Net
Hack Saw Stubs	dis 20
" " Eureka	dis 20
" " Star	dis 20
Saw Swages Diston's	dis 30
Atkins' Circular Saws	dis 40&45
" Mill, Mulay and Drag Saws	dis 40&10
" Wood Saws	dis 40&10
" Silver Steel Diamond Cross-cut Saws	70c per ft
" Dexter Cross-cuts	50c "
" Diamond "	30c "
" Tuttle Tooth Cross-cuts	25c "
" One-man Cross-cuts	32c "
No. 1 Handles	23c per pair
No. 6 "	16c "
Excelsior Saw Tools	$6 per doz
Derfection "	$15 "
Petroit Saw Works, Circular	dis 50
" " " Band	dis 25
" " " Mulay	dis 45

Taps.

Cards, Hand and Nut to 2 in	dis 50
Carpenters' " " "	dis 50
Morse " " "	dis 50
Pratt & Whitney " " new list	dis 10
Machine Screw Taps	dis 55
Pipe Taps to 2½ in	dis 70
Stay Bolt Taps	dis 25
Stove Bolt Taps	dis 55
Pulley Taps	dis 40

Vises.

Solid Box	dis 60
Parker's	dis 20@25
Prentiss	dis 20
Stephen's	dis 25@30
Barrett's	dis 30
Miller's Falls	dis 40
Merrill's	dis 15@20
Howard	dis 35

Wire.

New List, Jan. 18, 1884

Brass	dis 30
Copper	dis 40
Bright and annealed, Nos. 0@18	dis 70&10@75
" " Nos. 19@26	dis 75@75& 5
" " Nos. 27@36	dis 75&10& 5
Coppered Nos. 0 to 18, market list	dis 70@70& 5
Galvanized Nos. 0 to 18 " "	dis65& 5
Tinned market Nos. 0 to 18	dis 67½
Cast steel	dis 50
Tinned Broom Wire	dis 70&5@70&10
Annealed Fence, Nos. 8 and 9	dis 75
Annealed Grape, Nos. 10 to 14	dis 75
Stub's Steel Wire regular	95c ₩ lb dis 30

Wrenches.

Coe's genuine	dis 50
Girard Standard	dis 70&10
Agricultural	dis 75&10
Mechanic's	dis 55&10& 5
Bemis & Call's Combination	dis 35
Donohue's Engineers	dis 20&10
Lamson & Sessions Engineers	dis 60
Billings & Spencer's Drop Forged	dis 25
William's " "	dis 25
Alligator " "	dis 40

Bolt and Nut Works.

THE UPSON NUT CO., Manufacturers of Nuts, Washers, Carriage, Machine, Plow and Elevator Bolts, Coach Screws, etc.

Steel Stamps and Stencils.

FLEHARTY, J. H. & Co., Rubber Stampes Seals, Stencils, Automatic Check Punchs, and Numbering Machines. 92 Seneca St.

E. C. POPE,

COMMISSION DEALER IN

Iron Ore, Pig Iron

AND METALS.

Cleveland, - Ohio.

ESTABLISHED 1854.

PETER GERLACH & CO.,

MAKERS OF

Saws, Tools and Machinery.

Office and Warerooms, 28 Columbus St.
Factories on Columbus, Winter and Leonard Sts

Cleveland, Ohio, U. S. A.

THE CONDIT-FULLER CO.,

Pig and Bar Iron,

CLEVELAND, . OHIO.

Oglebay, Norton & Co.,

Successors to Tuttle, Oglebay & Co.

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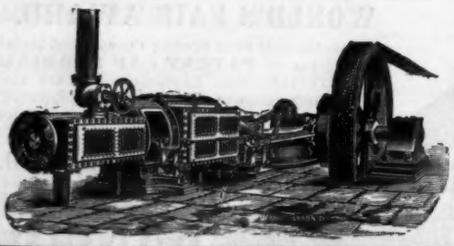

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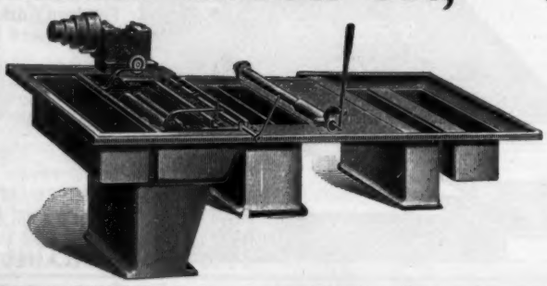

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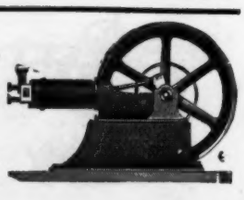

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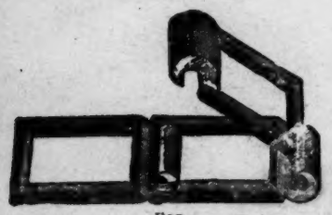

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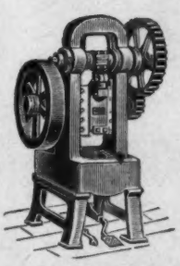

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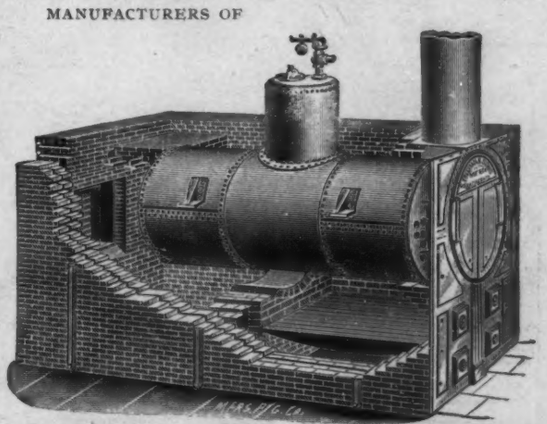

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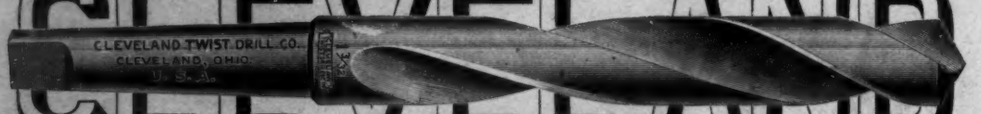

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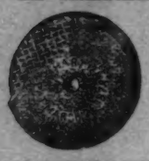

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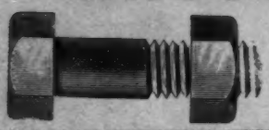

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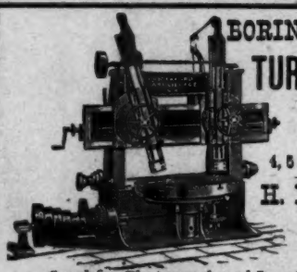

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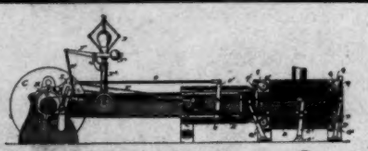

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